JAN 18 1933

VETERINARY MEDICINE

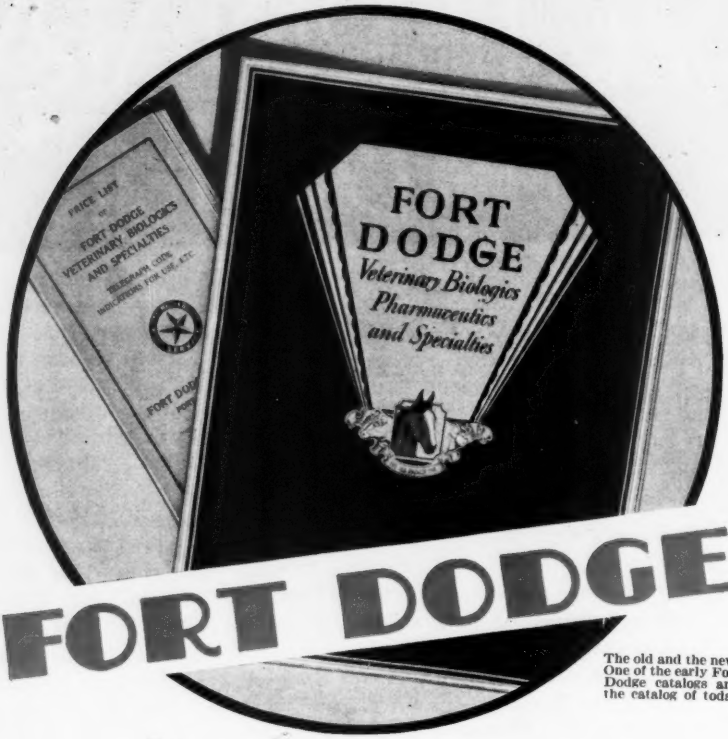
February, 1933

Contents

In the Field of Research....45
Pellagra-Preventing Foods....46
Bacteria Associated with Shipping Fever....47
Milk-Borne Epidemic of Typhoid Fever....47
Achievements of Veterinarians....47
The County Agent Problem....48
The 12th International Veterinary Congress....50
Association Meetings....51
N-Butylidene Chloride, a New Anthelmintic....52
Veterinarians in Rabies Control....64
Observations on Bovine Mastitis....65
Combined Soak Stall and Operating Stocks for Cattle....66
Sanitation Chief Reliance in Disease Control....69
Hog Cholera Control in Maryland....69
Eosinophilia in the Dog....70
Treatment for Retained Fetal Membranes....72
Abortion Disease Control on the Range....75
Fatty Infiltration of the Liver in Cattle....75
Horse Parasite Control Work....77
Toxic Fumes Kill Unhatched Chicks....77
Paratyphus in Cattle....77
Guarding Milk Supplies in Small Municipalities....78
Sources of Milk....80
What Shall I Feed My Dog?....81
Correcting Tail Carriage in Dogs....86

No. 2
VOL. XXVIII

75 E. Wacker Drive
Chicago, U. S. A.



FORT DODGE

The old and the new. One of the early Fort Dodge catalogs and the catalog of today

Although Fort Dodge is comparatively young in years among the world's pharmaceutic houses, it is the virility of this very youth that has put Fort Dodge high among the leaders of the industry. ● This comprehensive line is up-to-date and abreast of the times. ● Fort Dodge products are designed for the needs of the practitioner of *today*.

And yearly more veterinarians are turning to Fort Dodge. Sales of Fort Dodge pharmaceutics, for example, have increased every year for 12 consecutive years.

QUALITY - RELIABILITY - SERVICE

FORT DODGE LABORATORIES, INC.
Fort Dodge, Iowa

Veterinary Medicine

Registered in U. S. Patent Office

VOL. XXVIII FEBRUARY, 1933 No. 2

Published Monthly by the Veterinary Magazine Corporation
75 East Wacker Drive, Chicago, Ill., U. S. A.
$4.00 a Year

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of Mar. 3, 1879.
Entered as second-class matter under the title of American Journal of Veterinary Medicine, July 19, 1910, at Chicago, Illinois, under Act of March 3, 1879.
Copyrighted 1932, by Veterinary Magazine Corporation.
All matter appearing in this publication is covered by copyright, and no part of it may be reproduced without permission. Permission will be granted on request for the reproduction of anything in the columns of VETERINARY MEDICINE if the purpose of the reproduction is unobjectionable. Where there is any doubt as to the propriety of reproduction, the wishes of the author will be consulted.
D. M. Campbell. Editor A. T. Kinsley, Associate Editor
H. J. Mostyn, 230 Fifth Ave., New York, Eastern Representative

In the Field of Research

A new anodyne five times as powerful as morphine and without habit forming properties was discovered by Alvarez of the Mayo Clinic.

That sleep in man and hibernation in other animals are controlled by iodine compounds in the blood is indicated by investigations of Carter, a British scientist.

Evans (Alice C.) of the U. S. Public Health Service has found that a metamorphosis from coccus to bacillus, that is, from a spherical form to a rod form, is a regular part of the life cycle of certain germs.

The gene, the unit of heredity, has a diameter of 32 hundred-millionths of an inch, according to Blackwood of the University of Pittsburgh. Genes were first seen and photographed by Belling of the Carnegie Institute.

Prolactin, an anterior pituitary gland extract, the third to be isolated from this portion of the pituitary, has been found to produce milk secretion even in male animals by geneticists at the Carnegie Institution of Washington, D. C.

The malaria treatment for paresis, which is astonishingly successful in the treatment of white syphilitics, has been found to be unsuccessful in negroes.

Chambers and Gains of Texas Christian University report that bacteria in milk may be killed by extremely high-pitched audible sound waves. The process is called "electrical pasteurization" of milk.

Wyckoff of the Rockefeller Institute for Medical Research states that micro-motion pictures of germs show no life cycle with a filtrable phase such as Kendall reports as occurring in various species of bacteria. Rosenow of the Mayo Foundation suggests that filtrable viruses may be plastic and transparent forms of ordinary germs rather than extremely small organisms. Vinson of the University of Missouri offers experimental evidence that virus disease of plants and animals are caused by non-viable chemic substances analogous to enzymes. Quirk of the U. S. Department of Agriculture reports that bacteria may be made to change to invisible forms and back again to visible forms by regulating the acidity of culture media.

During 1932 a formula was found for the growth-promoting vitamin A by Karrer of the University of Zurich. This formula is closely related to that of artificial violet perfume. Vitamin A was isolated by Drummond of the University of London by splitting carotene, the yellow pigment of plants. Vitamin B was reported isolated by Windaus of the University of Göttengen, the formula being $C_{12}H_{17}N_3OS$. King and Waugh of the University of Pittsburgh obtained vitamin C, the scurvy preventing vitamin, in crystalline form and discovered it to be identical to the newly-discovered hexuronic acid obtainable from the adrenal gland. Rygh and Laland of Oslo reported that vitamin C may be derived from narcotine, an alkaloid of opium. That vitamin G consists of two chemical factors working together was indicated by the result of investigations by Sherman of Columbia University. That lack of phosphorus and vitamin D in the diet is the chief cause of dental decay was reported by Agnew of West China Union University. This confirms the earlier work of McCollum of Johns Hopkins University and in some measure refutes the findings of Mellanby of the British Medical Research Council that the lack of calcium or vitamin D or both in the diet is the principal cause of decay in teeth of man and animals.

Hemophilia is a sex-limited hereditary condition affecting only males and transmitted only through the female line. Thus a man may be a "bleeder" and have a number of sons and daughters none of them bleeders. None of the offspring of his sons will inherit the condition, but the sons of his daughters all will manifest it. Reasoning that there must be something in the female that inhibits the development of hemophilia, attempts at its control were made by various investigators by giving victims various preparations of female sex-glands. Encouraging results were obtained from ovarian preparations. The administration, however, has to be continuous to overcome the noncoagubility of the blood of bleeders. No permanent cure has been obtained nor has the temporary alleviation of the condition from the use of ovarian extract affected the hereditary transmission of the disease.

The people who have achieved, who have become large, strong, vigorous people, who have reduced their infant mortality, who have the best trade in the world, who have an appreciation of art, literature, and music, and who are progressive in science and in every activity of the human intellect, are the people who have used milk and its products liberally.—E. V. McCollum.

PELLAGRA-PREVENTING FOODS

So far, thirty-five foodstuffs have been tested. Of these milk (including buttermilk and canned evaporated and dried milk), fresh beef, canned corned beef, liver, canned salmon, canned haddock, tomatoes, turnip greens and canned English peas have each been found to prevent pellagra when added in sufficient quantity to an otherwise pellagra-producing diet. Dried beans and peas, eggs, canned spinach, green cabbage and canned string beans, though less effective, are valuable contributory sources of the pellagra-preventive factor. Cornmeal, wheat flour, rye flour, oatmeal, molasses, cane syrup, sweet potatoes, mature onions, carrots, rutabagas, salt pork, lard, cottonseed oil, butter and gelatin have little or no pellagra-preventive value, regardless of the quantity used. Dried yeast and commercial wheat germ, although not commonly looked on as human foods, are good sources of the pellagra-preventive vitamin and are valuable supplements, especially as temporary expedients under emergency conditions. A study of collard, kale and mustard greens is now in progress, with indications that the collard greens, at least, will prove to be of value.—G. A. Wheeler, et al., *J. A. M. A.*, July 19, 1932.

NOTE.—Foods that prevent pellagra in man prevent blacktongue in dogs.

BACTERIA ASSOCIATED WITH SHIPPING FEVER

In studies conducted at the Kansas Experiment Station, *Pasteurella boviseptica* was isolated in 80% of the cases of shipping fever where autopsies were made. In 60% of the 23 cases examined, *P. boviseptica* was associated with either colon type organisms or with members of the Alcaligines group, usually *A. bronchisepticus*. Immunization of guinea pigs and rabbits by broth and agar cultures showed that *P. boviseptica* had only very slight immunizing powers. A comparison of the agglutination titer produced in immunized rabbits and their survival following test injections showed that there was no direct or constant relationship between the degree of protection and the agglutination titer. A comparison of one virulent culture and an avirulent culture showed that there was no direct relationship between the virulence of a culture and its protective properties. The avirulent culture protected a greater number of rabbits than the virulent culture.

MILK-BORNE EPIDEMIC OF TYPHOID FEVER

S. H. Hurdle (*Journal of Preventive Medicine*, 5:465, November, 1931) reports an epidemic of typhoid fever in which infection was traced to milk from one dairy, illustrating the danger from a single carrier in even an occasional contact with food or milk supplies. In this epidemic 80 cases of typhoid occurred within a month, mostly within two weeks, in a town of about 11,000 population (Salisbury, Md.); there were 7 deaths. The majority of the patients were in good financial circumstances and living under good sanitary conditions in the residential section. The infection was traced to milk from a single dairy, or more particularly to milk from one of the farms supplying this dairy. On this farm a typhoid carrier was found, who did not regularly handle the milk, but who had assisted in handling the milk on at least one occasion in the early part of July. Otherwise sanitary conditions and methods of handling the milk at this dairy and on the farms supplying it were satisfactory.—*Medical Times.*

ACHIEVEMENTS OF VETERINARIANS

The people of the United States and Canada owe a greater debt for efficient service to the American Veterinary profession than most of them fully appreciate. In guarding the public health, as members of boards of health, and in directing milk, live stock, and meat inspection, the profession has rendered an important and efficient service to the general public. In the control of live stock diseases communicable to man, American veterinarians have rendered a service unsurpassed anywhere.

And in the control of infectious diseases among live stock the American veterinarian has a record unequaled anywhere in the world for courageous and efficient public service. Contagious pleuro-pneumonia, which for years was the scourge of the live stock interests of the old world, was stamped out of American herds completely. Foot and mouth disease, which is still afflicting the herds of Europe and other countries, although it has found its way into this country on several occasions, has never been able to maintain its existence here because of the heroic and efficient methods of eradication employed by the American veterinarian. That scourge of the Southern cattle industry, the cattle fever tick, which a quarter of a century ago infested parts or all of fifteen Southern states, has been eradicated from 85 per cent of the vast territory in which it formerly did millions of dollars damage every year. Tuberculosis in cattle, the white plague of the human race, has been so effectively attacked by the veterinary profession of this country that there is evidence to prove that it is not over 30 per cent as prevalent as fifteen or twenty years ago.

These are but a few of the achievements of the American veterinary profession, in addition to the invaluable services it has rendered to our tremendous live stock interests in the routine treatment and control of diseased animals.

An equally brilliant record has been made by American veterinarians in the fields of medical research.—Tail-Butler in the *Progressive Farmer.*

THE COUNTY AGENT PROBLEM

The problem of the county agent and of the Extension Services of the U. S. Department of Agriculture is linked up with the general problem of government in business and extortionate taxation. It is fortunate it is so. The general public cannot be expected to interest itself very much in the unfair and ruthless practices the extension service has adopted toward the veterinary profession, nor does the livestock industry care about this aspect of the matter, except as it may be convinced that this government bureau will deprive it of the essential veterinary service it now has. The government in business, however, is socialism and its corollary of staggering burdens of taxation affect all the people and is a matter in which all are interested.

The Federal Department of Agriculture is near the worst offender in the waste of public funds that has been carried out systematically and progressively at Washington for a dozen years and more. From 1789 to 1889, a hundred years, we got along without a Department of Agriculture. During that period practically all arable acres in the vast inland Empire from the Alleghanies to the Coast Ranges were brought under cultivation and agriculture enjoyed a place in our civilization that was envied by all other industries. In 1889 the Department of Agriculture was created, largely as a scientific organization. It continued as such to the retirement of Secretary James Wilson and to only a less degree under Secretary Houston. During this time it was unhesitatingly termed the greatest research organization in the world. It was the fine reputation for service that the department established in those years that enabled it, more than any other Federal executive department, to get appropriations for the inconceivably extravagant administrations of recent years. Its research was not discontinued,

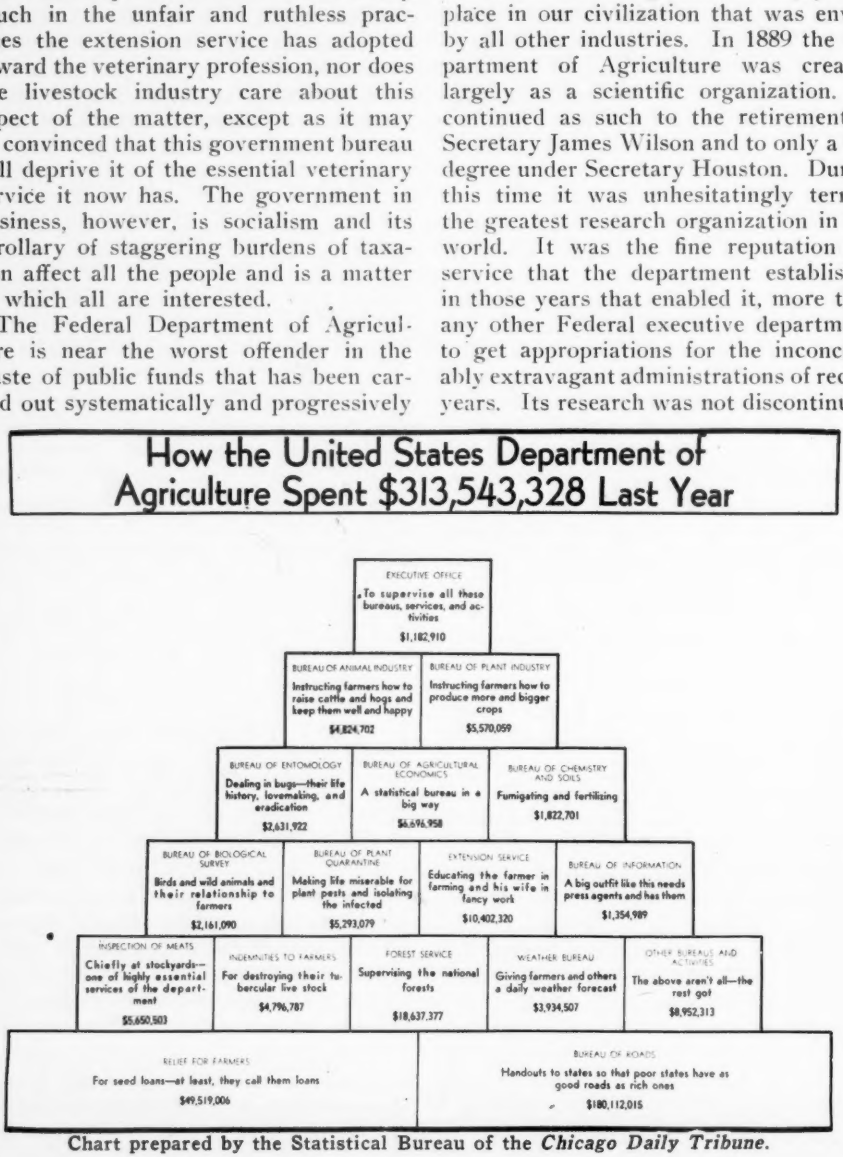

How the United States Department of Agriculture Spent $313,543,328 Last Year
EXECUTIVE OFFICE
To supervise all these bureaus, services, and activities
$1,182,910
BUREAU OF ANIMAL INDUSTRY
Instructing farmers how to raise cattle and hogs and keep them well and happy
$4,824,702
BUREAU OF PLANT INDUSTRY
Instructing farmers how to produce more and bigger crops
$5,570,059
BUREAU OF ENTOMOLOGY
Dealing in bugs—their life history, lovemaking, and eradication
$2,631,922
BUREAU OF AGRICULTURAL ECONOMICS
A statistical bureau in a big way
$6,696,958
BUREAU OF CHEMISTRY AND SOILS
Fumigating and fertilizing
$1,822,701
BUREAU OF BIOLOGICAL SURVEY
Birds and wild animals and their relationship to farmers
$2,161,090
BUREAU OF PLANT QUARANTINE
Making life miserable for plant pests and isolating the infected
$5,293,079
EXTENSION SERVICE
Educating the farmer in farming and his wife in fancy work
$10,402,320
BUREAU OF INFORMATION
A big outfit like this needs press agents and has them
$1,354,989
INSPECTION OF MEATS
Chiefly at stockyards—one of highly essential services of the department
$5,650,503
INDEMNITIES TO FARMERS
For destroying their tubercular live stock
$4,796,787
FOREST SERVICE
Supervising the national forests
$18,637,377
WEATHER BUREAU
Giving farmers and others a daily weather forecast
$3,934,507
OTHER BUREAUS AND ACTIVITIES
The above aren't all—the rest got
$8,952,313
RELIEF FOR FARMERS
For seed loans—at least, they call them loans
$49,519,006
BUREAU OF ROADS
Handouts to states so that poor states have as good roads as rich ones
$180,112,015

Chart prepared by the Statistical Bureau of the *Chicago Daily Tribune*.

no government bureau ever willingly discontinues anything, but the useful functions were submerged, and participated but little in the 1,400% increase in expenditures of the Department of Agriculture that occurred between 1911 and 1931. Established in 1889, the department's appropriations increased on the average somewhat less than a million dollars a year and in 1911 cost 20 million dollars. In the next eight years the expenditures doubled and in 1919 were 40 million.

Then the wild orgy of spending began in earnest and in 12 years, by 1931, the department was spending in round numbers 300 million dollars a year, not more than 11% of it having anything to do with agriculture. From a useful scientific organization, the agricultural department became a sluiceway for flooding Federal funds into states, usually on condition that the states match the waste dollar for dollar. With the accession of Secretary Hyde, whose qualifications for the position equal his qualifications to be Grand Lama of Tibet, the department became an out and out political organization attempting to do for the farm vote what the Department of Labor was created to do for the foreign vote. Its expenditures skyrocketed.

Destructive taxation has brought the government and the country to the brink of bankruptcy. The Federal government's expenditures are exceeding its receipts by $5,000 a minute. In three years of peace the Federal deficit has aggregated twice the amount of the national debt at the close of the Civil War. Despite protestations in high places no honest effort was made to balance the budget last year, and it was not balanced by a billion and a half dollars. Despite campaign promises, no serious attempt is likely to be made by the present administration or the "lame duck" session of Congress to balance the budget now. The agricultural department and its obnoxious extension service may be expected to ride through yet awhile on the crest of the wave. Despite the fact that the extension service failed utterly to "sell" the Farm Board to the farmers (its principal mission for more than a year) and notwithstanding its failure to save for the administration a single agricultural state in the recent election, it tried, and there is a feeling of gratefulness for its political efforts that will probably preserve it for the present. However, some Congress, and soon, *must* decrease government expenditure to a level that can be met by taxes. Therein lies a prospect of relief from governmental inefficiency and extravagance and meddlesome interference in business. As one of the most conspicuous examples of meddlesomeness, inefficiency, fu-

AT THE END OF THE LINE

tility and extravagance of government in business, the Extension Services of the U. S. Department of Agriculture may well come in for extermination. It is the duty of every veterinarian to lend all possible support to this consummation not only in the interest of self-preservation but as a high obligation of good citizenship. For government economy with tax relief is the only lever that will raise the nation out of the depression.

THE 12TH INTERNATIONAL VETERINARY CONGRESS

A. Eichhorn, chairman of the Organizing Committee of the 12th International Veterinary Congress, which will be held in New York City during August, 1934, has returned from Europe, where a number of conferences were held on matters concerned with the program for the Congress.

Before leaving for Europe, Doctor Eichhorn requested the General Secretary of the Congress to call a meeting of the officers to be held in Budapest while he was there. The meeting was called for November 3rd. Doctor Eichhorn having been unavoidably delayed, did not reach Budapest in time for the meeting. Later he saw most of the officials at their homes and the tentative program prepared by the Organizing Committee at its meeting in Atlanta last August was approved with some modifications.

The approved program has been sent to the national committees in all countries participating in the Congress for recommendations as to reporters on each subject from each country. The names of those selected in each country to discuss the various subjects on the program will be submitted to a meeting of the Permanent Committee of the Congress which will be held in Paris in May, 1933. It is highly desirable that a member of the Organizing Committee attend this meeting.

Doctor Eichhorn made inquiries concerning probable attendance at the Congress in six different countries and was pleased to find in each country a goodly number planning to attend. Every effort will be made to have governments, veterinary colleges, veterinary associations, etc., send delegates to the Congress.

The program for the Congress is as follows:

General Sessions

I. Opening Meeting:
   a. New Outlines for the Veterinary Police for the Control of Permanent Enzootics. (Festival Address.)
   b. The Relation of Veterinary Science to Animal Husbandry and to Public Health. Legal Protection for Veterinary Practice. (Festival Address.)

II. a. Filtrable Viruses.
   b. Infectious Abortion. Bang's Disease.

III. Closing Session.

Sectional Meetings

I. Pathology, Bacteriology, and Infectious Diseases.
   1. Tuberculosis Eradication, Immunity, and Protective Vaccination.
   2. Foot-and-Mouth Disease. (Significance of Specific Control Measures.)
   3. Hog Cholera. (Active Immunization.)
   4. Anthrax. (New Methods of Immunization.)
   5. Gas Edema Diseases. (Etiology and Symptomatology.)
   6. Paratyphoid Diseases.

II. Internal Medicine, Surgery, and Obstetrics.
   1. Parturient Apoplexy.
   2. Sterility.
   3. Diseases of Newly Born.
   4. Infectious Mastitis.
   5. New Developments in Veterinary Surgery.

III. Veterinary Medical Parasitology, and Parasitic Diseases.
   1. Therapeutics of Parasitic Diseases.
   2. Parasitic Immunity.
   3. Coccidiosis.

IV. Poultry Diseases.
   1. Fowl Typhus. (White Diarrhea.)
   2. Fowl Pest. (Fowl Plague.)
   3. Coryza.
   4. Psittacosis.
   5. Fowl Pox.
   6. Leukemia. Neuro-lymphomatosis Gallinarum.

V. Tropical Diseases.
   1. Piroplasmosis. (Systematic.)
   2. Spirochetosis.
   3. East African Horse Sickness.
   4. Anaplasmosis.
   5. Rinderpest. (Protective Immunization.)

VI. Meat and Milk Hygiene.
   1. Tests (proof) of Pasteurization.
   2. Meat Inspection in Its International Relation.

VII. Zootechnics and Dietetics.
   1. Applied Science of Hereditary.
   2. Deficiency Diseases.
   3. Feeding According to Scientific Principles.
   4. The Question of Blood Groupings.

Association Meetings

By E. T. BAKER, Moscow, Idaho

WHY do not more veterinarians attend association meetings? True, some of the smaller groups are well attended, and have interesting programs, but the larger ones seem to resemble a grand lodge convention. Only the old guard is present, and it passes into history without a ripple.

With the exception of meeting old friends, and looking over the exhibits of new instruments, biologics and pharmaceuticals, what does the average practitioner learn? Can he afford to leave his practice, and dig down into his jeans for the necessary expense to attend a meeting about like the following?

A learnéd savant, who has never been out of a laboratory in his life, starts the program off by reading a forty-five minute spasm on the life cycle of the goofus flea. The scientist would not star as a reader, and no one cares what he is mumbling about anyway.

Next, is a paper on the "Etiological Aspects of Coccidiosis in Blonde Chickens," by Dr. Silas Peewee, of the United Henhouse Laboratories. After a fifty-minute discussion on the subject, the doctor states the condition should be looked after by the farm bureau or the hired man.

The secretary of the association now stands erect on both hind feet, and tells the members what a serious financial condition is confronting their beloved society. With a pained look on his face and genuine pathos in his voice like that used in sympathizing with a farmer whose horse has just passed over the Great Divide, he tells the members if they do not kick through with their dues, it's going to be a long, hard winter. He then sits down.

The president of the association now makes an impassioned plea for the old fellowship and all that it stands for in modern civilization. He touches on the fall of Rome, the Dark Ages, and the Last Election. He asks them, with touching pathos, what unborn veterinarians will do in the years to come if the members do not come through with the mazuma. He then seats himself amid tumultouous aplpause, the most delinquent members clapping loudest.

Finally, Professor J. Quincy Spriggs, of the state university arises and starts in on a two-hour paper on "The Needs of the Profession and Particularly the Needs of the University." The professor begins by telling his auditors they are the most useful men in their respective communities. He tells them they, and they only, with perhaps the aid of a county agent and his extension veterinarians, stand between the disease germ hordes and the honest farmers' livestock.

Professor Spriggs urges the horny-handed practitioners to hasten to the farms of the sick and the afflicted without the vulgar or ulterior thoughts of financial reward. He tells them to labor for humanity's sake. He hopes they will see to it the university appropriations are not cut down, so that he will be able to continue to receive his five hundred dollars per month. He dwells on the unlimited opportunities for doing good among the rural clients, who worship their veterinarian so much they know he would scorn filthy lucre for his services. He assures them he will always be glad to cooperate with their county agent and to send an extension expert to teach the boys and their dads how to vaccinate the little piggies and the calves. Finally, the professor, after having touched on everything in general and nothing in particular, sits down, amid thundering applause.

That evening a banquet is held, but not much enthusiasm is aroused over cold coffee. Most of the stories are so ancient the younger generation think they are new.

The sessions come to a close. The members return to their homes wondering what it is all about; They also vow not to return next year.

N-Butylidene Chloride, a New Anthelmintic

By WILLARD H. WRIGHT, JOHN BOZICEVICH and PAUL C. UNDERWOOD, Zoological Division, and JACOB M. SCHAFFER, Biochemic Division, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Introduction

During the past decade, certain chlorinated alkyl hydrocarbons have had widespread application as anthelmintics in human and veterinary medicine. Following the work of Hall,[3] who demonstrated the value of carbon tetrachloride as an anthelmintic for the removal of ascarids and hookworms from the dog, this compound has been widely adopted as a treatment for ancylostomiasis in man and has been used in over 15,000,000 treatments for hookworm disease. Hall and Shillinger[7] later found that tetrachlorethylene also was effective against hookworms. While this compound has not replaced carbon tetrachloride in the treatment of hookworm disease in man, it is at the present time very widely used in veterinary medicine, and is apparently a safer drug than is carbon tetrachloride.

In attempting to correlate the anthelmintic efficacy with the chemical constitution and physical properties, Wright and Schaffer[14, 15] conducted critical tests with a large number of chlorinated alkyl hydrocarbons. Previous to their investigations, only chlorinated hydrocarbons of the methane and ethane series had received critical anthelmintic test. However, Wright and Schaffer showed that certain compounds belonging to other series likewise show a high degree of anthelmintic efficacy. The investigations referred to have shown also that the theory suggested by Hall,[4] that an increase in the chlorine content of the hydrocarbon molecule was correlated with an increase in the anthelmintic efficacy, is not tenable. Some monochlor compounds investigated by Wright and Schaffer were found to have a high anthelmintic efficacy, while some compounds containing a high percentage of chlorine in the molecule were found to have little or no anthelmintic value for hookworms. The investigations referred to have established the fact that anthelmintic efficacy for hookworms is more directly associated with the water solubility of chlorinated hydrocarbons, a matter which was first discussed in some detail by Hall and Cram,[5] than it is with the percentage of chlorine in the molecule or the arrangement of the carbon, hydrogen or chlorine atoms in the molecule.

During the course of the above mentioned investigations, several chlorinated alkyl hydrocarbons were found to possess a high anthelmintic efficacy for ascarids and hookworms in the dog; one of these, normal butylidene chloride, showed in preliminary tests an efficacy of 100% for the removal of ascarids and 95% for the removal of hookworms from the dog.

In view of the results obtained in the preliminary tests, further tests were conducted with this compound to confirm the results of previous investigations and to determine whether this compound could be used advantageously as an anthelmintic for other animals. These additional tests have been conducted on dogs, cats, horses, cattle and chickens. It is the purpose of this paper to present the results of these tests and to summarize the available data concerning the value of normal butylidene chloride as an anthelmintic.

Chemical and Physical Properties

Normal butylidene chloride, $CH_3.CH_2.CH_2CHCl_2$, is obtained by the action of phosphorus pentachloride on n-butyric aldehyde. For the present experiments a high grade, commercially prepared product was washed first with a 2% sodium bicarbonate solution and then with water, after which it was dried and distilled. Thus purified,

the n-butylidene chloride was a clear, colorless, sweet-tasting liquid with a pleasant odor and possessing the following constants: Boiling point, 115° to 116.5° C. (760 mm.); specific gravity, 1.084 (25°/25°); solubility, one gram in 2000 grams of water. In water solubility, n-butylidene chloride lies between carbon tetrachloride (1:1250) and tetrachlorethylene (1:5300), and is situated within the range of solubilities which Wright and Schaffer found to be most conducive to a high anthelmintic efficacy.

Technic of Anthelmintic Experiments

All experiments reported in the present paper were conducted as follows: The animals were fasted for the period designated under the various protocols, and then dosed with n-butylidene chloride. In some cases, where designated, the anthelmintic was followed by a purgative. All feces passed by the animals were collected each 24 hours or oftener, and washed through a series of screens to recover any worms removed by the treatment. The animals were killed at different periods following treatment, and the entire contents of the digestive tract were washed through screens and any worms present were collected, identified and counted. The percentages of efficacy are computed on the basis of the total number of worms passed following treatment plus dead worms found post mortem, as against the total number of worms present at the time of treatment, which is represented by the number of worms passed or killed plus live worms found on post-mortem examination.

Tests on Dogs

Table 1 presents the protocols of the experiments on dogs. In these tests, n-butylidene chloride at a dose rate of 0.3cc per kilogram of body weight, which had been determined previously to be the therapeutic dose rate, removed 96.5% of the ascarids present in 12 dogs. In 10 of these animals, the drug removed all ascarids present; in dog 11, it removed 6 ascarids and left one and in dog 39, it removed two ascarids and left one. As the aggregate efficacy secured by Wright and Schaffer[15] in dogs was 100% for ascarids, it is apparent that the drug is very effective for the removal of the two species of ascarids which commonly infest the dog.

N-Butylidene chloride removed all hookworms (*Ancylostoma caninum*) present in the 11 dogs which harbored this species. The present tests show a slightly higher degree of efficacy for hookworms than did the tests reported by Wright and Schaffer in which the aggregate efficacy was 95%.

The results against whipworms are disappointing but are in general accord with those obtained with other chlorinated hydrocarbons. The percentage of efficacy varied from 0 to 100 in the 16 dogs which harbored whipworms. In dogs 12 and 39, the drug removed all whipworms present. It is apparent that n-butylidene chloride will remove all whipworms present in some cases and in such cases we may assume that the drug actually enters the cecum, while in those cases in which the drug is a failure we may assume that it does not actually come in contact with the worms. However, n-butylidene chloride is no more dependable for the removal of whipworms than is any other chlorinated alkyl hydrocarbon, its lack of dependability being probably associated with its haphazard entrance into the cecum.

Tests on Cats

Table 2 gives the results of the tests with n-butylidene chloride for ascarids and hookworms in the cat. The aggregate efficacies of the drug for these parasites in the cat fall below those for ascarids and hookworms in the dog. N-Butylidene chloride was 100% effective for ascarids in 16 of 26 cats; in one case the efficacy fell as low as 35.7%. In some cases, however, where very low efficacies were secured, the cats vomited within 15 to 30 minutes after treatment and were not redosed. It is probable that some of the drug was expelled in the vomitus thus accounting for the failure of the drug to remove the majority of worms present.

For hookworms, n-butylidene chloride proved to be 100% effective in 8 of 11 cats; the unaccountably unsatisfactory results in three other cats brought the aggregate effi-

cacy down to 81.6%. It seems probable, however, that normal butylidene chloride will in the majority of cases remove all or nearly all hookworms from cats, and will show a high percentage of efficacy in the majority of cases for the removal of ascarids. No unfavorable reactions were observed in any of the cats treated with the drug; toxicity tests have not been carried out on cats to determine the margin of safety of the drug for these animals, but previous work with dogs indicated that the drug possesses a margin of safety for dogs of at least 33; probably this factor is even higher for dogs. In view of this fact, it would appear reasonable to assume that n-butylidene chloride may be given to cats in general in therapeutic doses without producing any marked unfavorable reaction.

Tests on Horses

Critical tests with n-butylidene chloride for parasites of the horse have been reported by Wright et al.[13] In these tests the drug administered to four animals at dose

TABLE 1.—Anthelmintic efficacy for ascarids, hookworms and whipworms in the dog of n-butylidene chloride at a dose rate of 0.3 cc. per kilogram of body weight, administered after a 24-hour fast.

Dog No.	Weight	Worms passed following treatment			Worms recovered post mortem			Anthelmintic efficacy against		
		Ascarids	Hook-worms	Whip-worms	Ascarids	Hook-worms	Whip-worms	Ascarids	Hook-worms	Whip-worms
	Kilos							*Per cent*	*Per cent*	*Per cent*
7	3.63		2	0		0	2		100	0
9	5.0		5	2		0	17		100	10.5
10	4.08	1	70		0	0		100	100	
11	5.0	6	9	21	1	0	105	85.7	100	16.7
12	5.9		15	3		0	0		100	100
18	8.16	13		2	0		50	100		3.8
21	4.08	10	1	0	0	0	10	100	100	0
22	6.8	0	0	0	0	0	0	no conclusions		
23	14.09	1	13	1	0	0	7	100	100	12.5
24	7.26	1	2	1	0	0	37	100	100	2.6
26	6.8			0			6			0
27	5.0	1	8	0	0	0	16	100	100	0
29	8.62			0			3			0
30	5.0	0	0	0	0	0	0	no conclusions		
32	7.26	2		0	0		6	100		0
36	9.53	1	12		0	0		100	100	
37	10.44	2			0			100		
39	7.71	2	3	1	1	0	0	66.7	100	100
41	8.62	15		2	0		20	100		9.0
44	6.35			4			37			9.8
46	5.45			0			122			0
	Totals	55	140	37	2	0	438	96.5	100	7.8

TABLE 2.—Anthelmintic efficacy for ascarids and hookworms in the cat of n-butylidene chloride at a dose rate of 0.3 cc. per kilogram of body weight, administered after a 24-hour fast.

Cat No.	Weight	Worms passed following treatment		Worms recovered post morten		Anthelmintic efficacy against	
		Ascarids	Hookworms	Ascarids	Hookworms	Ascarids	Hookworms
	Kilos					*Per cent*	*Per cent*
61	1.135	13		1		93.0	
62	0.681	6		0		100.	
63	0.908	19		0		100.	
65	1.81	4		0		100.	
66	1.135	1		0		100.	
72	0.676	56		0		100.	
77*	0.676	5		9		35.7	
81	2.27	14	2	0	0	100.	100.
83	1.58	4		5		44.5	
68	2.27	1		0		100.	
71	1.36	19		0		100.	
73*	1.81	21	3	1	2	95.5	60.0
75*	2.05	31		3		91.2	
80	1.81	23		10		69.7	
84	2.27	13	0	2	1	86.7	0
85	2.72	2	1	1	4	66.7	20.
64	2.27	4		2#		66.7	
67	4.08	6		0		100.	
70	2.72	12		0		100.	
78	0.908	14	1	0	0	100.	100.
87	0.681	2	1	0	0	100.	100.
89	3.40	10	3	0	0	100.	100.
90	2.03		1		0		100.
94	2.5	17		5		77.3	
92	1.36	16	1	0	0	100.	100.
93	1.58		6		0		100.
95	3.17	11		0		100.	
96	2.49	44	12	0	0	100.	100.
	Totals	368	31	39	7	90.4	81.6

*Vomited within 15 to 30 minutes after treatment. Not redosed.
#Very small, immature forms.

rates of 0.207 to 0.333cc per kilogram of body weight, and followed in five hours by 960cc of raw linseed oil for a 1,000-pound animal, resulted in efficacies of 50%, 94%, 100% and 100%, respectively, against *Strongylus* spp., and of 100% for cylicostomes in all four animals. The anthelmintic removed all the *Poteriostomum* spp. present in the three animals that harbored these parasites.

In other tests the efficacy of n-butylidene chloride for the above-mentioned parasites was considerably lowered where the drug was administered in raw linseed oil or where it was followed by aloes or by a castor-oil-mineral-oil mixture. When administered in raw linseed oil, the drug was relatively ineffective for the removal of ascarids, but when given without oil the drug was apparently effective for the removal of all worms of this species. N-Butylidene chloride proved to be partially effective against *Habronema muscae* and *H. microstoma*. It seems probable that a preliminary gastric lavage, as used by Wright, Bozicevich and Underwood[12] with the carbon disulphide treatment for *Habronema* spp., would add to the efficacy of n-butylidene chloride against these parasites.

N-Butylidene chloride was found to be unsatisfactory against bots (*Gasterophilus* spp.); in one case the drug removed 46.7% of the bots but in other tests the drug had a very low efficacy against these forms.

In order to determine the margin of safety of n-butylidene chloride, toxicity tests were carried out on two animals as follows:

Horse 449, a 12-year-old chestnut gelding weighing 523 kilograms (1,150 pounds), was dosed at 11:00 a. m. on January 13, 1931, with 1.5cc per kilogram of body weight of n-butylidene chloride, a total of 784.5cc administered by stomach tube. The animal had been fed on the morning of treatment. There was no immediate reaction to the treatment. At 12:30 p. m. there was a slight drowsiness and slight incoordination of movement. At 2:00 p. m. the incoordination of movement was a little more marked. At this time the odor of n-butylidene chloride was noticeable in the expired air. At 9:00 a. m. on January 14, the animal showed some evidence of colicky pain; it had cleaned up nearly all its grain feed. The temperature was 37.2° C. Peristalsis was diminished and the animal was constipated. It was given one quart of raw linseed oil at 11:00 a. m. By 3:30 p. m. the bowels had moved several times; the temperature was 37.9° C. On the morning of January 15, the animal appeared brighter although it was not eating. The temperature was 39.3° C. Sufficient purgation was not obtained and an additional pint of raw linseed oil was given. On January 17, there was active purging and from this time on the horse recovered rapidly. On January 19 the appetite had partially returned; the temperature was 38.0° C.

Horse 512, a 15-year-old bay gelding weighing 477 kilograms (1,050 pounds) was dosed at 11:15 a. m. on January 13, 1931, with 3.0cc of n-butylidene chloride per kilogram of body weight, a total of 1,431cc, administered by stomach tube. There was no immediate reaction to the treatment. At 12:30 p. m., the animal exhibited slight drowsiness and a slight incoordination of movement. At 9:00 a. m. on January 14, the animal appeared to be weak and dizzy; it had not touched its morning grain feed. Peristalsis was diminished and there was constipation. The temperature was 37.4° C. The horse was given one quart of raw linseed oil at 11:00 a. m. At 3:30 p. m. the animal appeared to be very weak; it was staggering from side to side. There had been no bowel movement during the day. One-fourth grain of arecoline hydrobromide was administered and the dose was repeated in one-half hour. The arecoline produced considerable distress; salivation was profuse but only a small quantity of feces was passed. Peristalic sounds were entirely absent. At 9:00 a. m. on January 15, the animal appeared to be brighter and stronger; the temperature was 37.9° C. During the night the animal had broken out of the stall and the stable. There was a cold wind blowing; the atmospheric temperature at 9:00 a. m. was 15° F. On the morning of January 16, the animal appeared to be much

improved; the bowels had moved slightly; the temperature was 37.3° C. On January 17 the animal appeared to be stronger and brighter; the temperature, however, was 39.3° C. The appetite had partially returned. On the morning of January 19, the animal appeared to be in much pain; the respiration was very rapid; the temperature was 40.4° C. A diagnosis of pneumonia was made. The animal died at 1:30 p. m. January 19. Necropsy revealed a lobar pneumonia in the upper lobes of both lungs, which showed red hepatization. There were no other lesions.

Horse 449 tolerated a dose of 1.5cc of n-butylidene chloride per kilogram or about seven times the lowest therapeutic dose of 0.207cc per kilogram of body weight. It appears probable that Horse 512 would have survived the treatment, had it not died of pneumonia following exposure, as it showed signs of improvement prior to the time it contracted pneumonia. This animal received a dose of 3.0cc of n-butylidene chloride per kilogram of body weight, a dose which is approximately 14 times the therapeutic dose of 0.207cc per kilogram. It would appear from these tests, that n-butylidene chloride possesses an adequate margin of safety for the horse. Further use of the drug upon a large number of animals, however, will be necessary to establish beyond peradventure of a doubt, its safety for use under all conditions. From the above-mentioned tests, it would appear that in the horse, n-butylidene chloride is responsible for constipation; the tendency to constipation was also noted in critical tests in which the drug was given in therapeutic dose rates. The drug should, therefore, be followed in five hours by an adequate dose of raw linseed oil, this purgative having been found in the previous tests to be the most satisfactory one for use in connection with this drug.

In order to determine whether the effective dose of 0.2cc of n-butylidene chloride per kilogram of weight for the removal of strongyles and cylicostomes from the horse could be reduced still further, an additional test was carried out.

Horse No. 3 was a sorrel gelding, 12 years of age and weighing 686.3 kilograms (1,510 pounds). The animal was fasted for 52 hours and given 0.1cc of n-butylidene chloride per kilogram of body weight, in hard gelatine capsules, followed in five hours by one quart of raw linseed oil by stomach tube. It was intended that the previously determined effective dose of raw linseed oil, i. e., one quart or 960cc per 1,000 pounds of body weight, should be given in this case, but through an inadvertence the animal was given only one quart of oil instead of oil at the rate of one quart per 1,000 pounds of body weight. The results were consequently affected by a dose of oil inadequate for an animal of this weight.

Table 3 presents the protocols of this test. The drug removed 28.6% of *Gasterophilus intestinalis*, 5.2% of *G. nasalis*, or 6.3% of both species of *Gasterophilus*. This is in close accord with the results reported by Wright et al., for larger doses of the drug. The results against *Strongylus* spp. and cylicostomes were probably influenced by the fact that suitable purgation was not provided in this case. While Wright et al. secured efficacies of 50 to 100% against *Strongylus* spp. when the drug was used in larger doses and followed by an adequate dose of oil, in the present test n-butylidene chloride removed only 52% of the strongyles and 67.7% of the cylicostomes. The drug failed to remove any ascarids but was 100% effective against both *Oesophagodontus robustus* and *Oxyuris equi*.

From the results of this one test in which an adequate dose of purgative was not given, it seems probable that n-butylidene chloride could be recommended for general use in a dose of 0.1cc per kilogram for the treatment of horse parasites, and that the drug when given in this dose and followed in five hours by an adequate dose of raw linseed oil, would probably be effective against strongyles, cylicostomes, *Oesophagodontus* spp., and *Oxyuris equi* in the horse. However, further tests are needed to establish this point.

Tests on Cattle

N-Butylidene chloride was administered in doses of 15 to 30cc to 15 calves weighing

from 68 to 159 kilograms (150 to 350 pounds), and 8 to 18 months of age. The treatment was immediately followed by 1 to 2 ounces (30 to 60 grams) of magnesium sulphate administered in hard gelatine capsules. There were no unfavorable reactions to the treatment. These calves were being maintained in an experiment dealing with abortion disease and were not available for slaughter to determine the exact efficacy of the treatment. However, other calves in the same lot had previously succumbed to parasitic infestations and these animals showed on necropsy a large number of parasites, particularly hookworms. Feces from five of the calves were secured for three days following treatment and washed through screens to recover any worms passed. Calves 1511, 1561 and 1564 passed no parasites following treatment. Calf 1525 passed three *Oesophagostomum radiatum* two days after treatment and 15 *Bunostomum phlebotomum* on the third day after treatment. Calf 1563 passed nine *Haemonchus contortus* and three *Nematodirus* spp. on the day following treatment.

Egg counts were made on the feces of these five calves for three consecutive days prior to the treatment and on the tenth, eleventh and twelfth days after treatment. These counts, the technic of which was a modification of the method of Stoll[9] and Stoll and Hausheer,[10] failed to indicate that the treatment resulted in any material reduction in the number of parasite ova passed in the feces. However, all the calves made a good clinical improvement following the treatment and there were no more losses due to parasitism.

Calf 1589.—A critical test with n-butylidene chloride was carried out on this animal which was 21 months old and weighed 101 kilograms (223 pounds). It was fasted for 36 hours and dosed with 1cc of n-butylidene chloride per kilogram of body weight, a total of 101cc administered by stomach tube and followed immediately by four ounces (120 grams) of magnesium sulphate in solution, also administered by stomach tube. There was no immediate reaction to the treatment. The animal was in poor condition; the abdomen was distended, the mucous membranes were anemic and the calf showed marked emaciation.

On the morning following treatment, the animal ate only part of the grain ration and was so weak it had to be helped to its feet, although it ate hay and rumination was normal. There were exaggerated peristaltic sounds, and some bloating and muscular trembling of the posterior limbs. No feces had been passed since treatment; the animal strained as if to defecate but was unable to pass feces. At 3:30 p. m. on this day, the animal had passed a small quantity of very hard feces. At this time an enema of 10 quarts of warm soapy water was administered and six ounces (180 grams) of magnesium sulphate in solution were given by stomach tube. On the second morning after treatment, the animal had returned to normal. The bowels had moved copiously. On the second day after treatment the animal passed one *Bunostomum phlebotomum,* one *Trichuris ovis* and one *Oesophagostomum radiatum.* On the third day after treatment, one *Bunostomum phlebotomum* and two *Oesophagostomum radiatum* were passed. The calf was killed four days after treatment and the following parasites were recovered post mortem: Abomasum, three *Haemonchus contortus,* 680 *Ostertagia ostertagi,* and 336 *Trichostrongylus extenuatus;* small intestine, 58 *Bunostomum phlebotomum,* 106 *Nematodirus spathiger,* 320 *Cooperia oncophora,* 78 *Cooperia punctata* and two *Capillaria brevipes;* cecum and colon, 81 *Oesophagostomum radiatum,* nine *Trichuris ovis,* five *Bunostomum phlebotomum,* and two *Nematodirus spathiger.* The treatment was entirely ineffective against *Ostertagia ostertagi, Haemonchus contortus, Trichostrongylus extenuatus, Cooperia oncophora, Cooperia punctata* and *Capillaria brevipes.*

The five hookworms found in the large intestine were dead and were passing out; counting these specimens as having been removed by the treatment, the drug removed 7 of 65 *Bunostomum phlebotomum* or 10.8%. Counting the two specimens of *Nematodirus spathiger* found in the colon

as having been removed by the treatment, the drug was 1.9% effective against this species. The drug removed 1 of 10 whipworms present or 10%. There were no post-mortem lesions due to the anthelmintic.

Calf 1758, a one-year old Holstein male weighing 80 kilograms (176.5 pounds), was deprived of food and water for 44.5 hours and was dosed with n-butylidene chloride at the rate of 0.5cc per kilogram of body weight in a solution of four ounces (120 grams) of magnesium sulphate in 360cc of water. The mixture was given as a drench. On the first day after treatment, the calf passed three *Oesophagostomum radiatum* and two *Haemonchus contortus*. The second day the animal passed two *O. radiatum*. No worms were recovered from the feces on the third and fourth days after treatment. The animal was killed on the fourth day after treatment and the following parasites were recovered post mortem: Abomasum, 23 *Haemonchus contortus* and numerous *Ostertagia ostertagi;* small intestine, one *Bunostomum phlebotomum,* numerous *Nematodirus* spp., numerous *Cooperia punctata,* and numerous *Cooperia oncophora;* cecum and colon, two *Trichuris ovis,* and 276 *Oesophagostomum radiatum*. The treatment was 8% effective for *H. contortus,* 1.8% effective for *O. radiatum* and 0% effective for *Ostertagia* spp., *Cooperia* spp., *Nematodirus* spp., *Bunostomum phlebotomum* and *Trichuris ovis.*

The data supplied by the above-mentioned tests on cattle are fragmentary and do not form a sufficient basis upon which to evaluate the anthelmintic efficacy of n-butylidene chloride. The evidence would tend to indicate that this compound is not an effective anthelmintic for gastro-intestinal parasites of cattle. However, the administration of anthelmintics to cattle or other ruminants is not as simple a procedure as that in other animals. The fact that an anthelmintic must pass through three compartments of the ruminant stomach before it comes into the abomasum, renders any treatment for parasites of ruminants a rather haphazard procedure. For some reason the difficulty is greater with cattle than with sheep.

Tests carried out by the writers and confirmed by others indicate in general that fluids administered by drench usually go into the rumen and that capsules invariably go there. Daubney[1] has found that liquids administered by stomach tube passed in the usual manner usually go into the rumen, but if the stomach tube is passed the entire length of the esophagus, the liquid tends to go more frequently to the abomasum. Wester[11] in his studies on the physiology of ruminant digestion reports that the administration of certain alkaline salts, such as sodium chloride or sodium bicarbonate, sets up a reflex in the esophagus which closes the esophageal groove and permits the solution to go direct to the abomasum. In testing this method in an effort to confirm Wester's observations, Ross[8] found that the administration of alkaline salts *per se* did not have any direct bearing on the ultimate fate of liquids administered as a drench. On the other hand, Ross found that after food and water had been withheld for a period of 40 hours or more, drenches in the majority of cases went direct to the abomasum. These observations are of great importance in connection with the administration of anthelmintics to ruminants. In the experiment involving calf 1758, the writers followed the recommendations of Ross in regard to the period of withholding both food and water. However, in this case it is apparent that the anthelmintic did not go direct to the abomasum, as such a demonstrably effective drug as n-butylidene chloride would probably have removed *Haemonchus contortus* and possibly *Ostertagia ostertagi* and other species had it reached the fourth stomach in any concentration.

As critical tests with tetrachlorethylene have failed also to indicate any appreciable efficacy for the removal of cattle parasites, it is evident that the failure to secure results in the present case is not necessarily indicative of any lack of value of n-butylidene chloride. Rather some method of administration must be found which will insure the anthelmintic reaching the fourth stomach at least in the majority of cases and not being

delivered into one of the first two compartments of the ruminant stomach to be dissipated there before it has an opportunity to act on parasites farther down the digestive tract.

Tests on Chickens

Table 4 records the protocols of tests with n-butylidene chloride at various dose rates for the removal of *Ascaridia lineata* and *Heterakis gallinae* from chickens. The drug in doses of 1cc removed all *Ascaridia* from four of six birds, was 92.3% effective in one case, and 50% effective in another bird. In doses of 2cc, 3cc and 6cc, n-butylidene chloride was entirely effective in removing *Ascaridia* from all infested birds. In 21 infested birds, the drug showed an aggregate efficacy at all dose rates of 98.4%.

The results against heterakids were not promising. The efficacy of the drug varied in individual birds from 0 to 100%; the aggregate efficacy for all birds was 4.7%. Anthelmintics administered orally generally fail to show a high degree of efficacy for the removal of heterakids from chickens, probably because of the haphazard entrance of the anthelmintic into the ceca of birds. Hall and Shillinger[6] and Graybill and Beach[2] tested carbon tetrachloride on chickens and found that the drug administered orally was not effective for the removal of heterakids. The findings in the present case indicate that n-butylidene chloride may be effective for the removal of heterakids from poultry when the drug actually enters the ceca but that the penetration of the drug into the ceca occurs too uncertainly to warrant the use of the drug as a treatment against this parasite. On the other hand, the high efficacy of n-butylidene chloride against *Ascaridia* indicates that the drug is dependably effective for use against this parasite, when the drug is administered in a dose of 2cc for adult birds.

TABLE 3.—Anthelmintic efficacy, for horse parasites, of n-butylidene chloride at a dose rate of 0.1 cc. per kilogram of body weight, administered after a 52-hour fast, and followed by 960 cc. of raw linseed oil.

Item	Bots		Strongyles			Ascarids	*Oesophagodontus robustus*	Cylicostomes	*Oxyuris equi*
	G. intestinalis	*G. nasalis*	*S. vulgaris*	*S. edentatus*	Unidentified (a)				
Worms passed following treatment:									
First day								48	
Second day	4	2			1			442	2
Third day		1						1192	
Fourth day		1						1392	
Small colon P.M.		3			1		1	692	
Large colon P.M.		8		8 (dead) (b)	16 (dead) (b)				
Total worms removed or killed	4	15	0	8	18	0	1	3766	2
Worms recovered post mortem in:									
Stomach	10	241							
Small intestine		31				2			
Cecum			16					56	
Large colon			8					1744	
Total worms not removed or killed	10	272	24	0	0	2	0	1800	0
Efficacy of treatment (per cent)	28.6	5.2	0	100	100	0	100	67.7	100
	All bots—6.3 per cent		All strongyles—52.0 per cent						

(a) Worms classed as unidentified were those so decomposed that identification was impossible.
(b) These forms were so macerated and decomposed that they had obviously been killed by the treatment and should be credited to the anthelmintic.

The birds in the present tests tolerated n-butylidene chloride well and showed no reaction to the treatment. The drug in a dose of 4.29cc per kilogram of body weight caused no reaction in chicken 678.

Action in Man

In view of the satisfactory anthelmintic action of n-butylidene chloride for the removal of ascarids and hookworms from the dog, the drug has been suggested to some physicians for tests on man. At various times, some of us have taken n-butylidene chloride in doses up to 5cc without any appreciably unpleasant reaction. A dose of 5cc produced a feeling of warmth in the epigastrium, followed by some eructation. One to two hours afterward a feeling of levitation was experienced but there was no dizziness. Even in doses as low as 1cc n-butylidene chloride acted as a laxative, in contradistinction to its action in the horse in which the drug appears to be constipating.

Pathology

Dogs.—The majority of the dogs used in the present tests showed no gross pathological alterations which could be attributed to the administration of the drug. In a few of the test animals, there was a slight inflammation of the small intestine. Wright and Schaffer[15] have reported that n-butylidene chloride in doses up to 9cc per kilogram of body weight, administered over a period of two days, caused only a slight enteritis, while the administration of the drug in a single dose of 4cc per kilogram resulted in an inflammation of the small intestine.

Histological changes in the liver of the dogs consisted in cloudy swelling of slight to moderate intensity and, in a few animals,

TABLE 4.—The anthelmintic efficacy for *Ascaridia* and *Heterakis* in the chicken of n-butylidene chloride at various dose rates.

Chicken No.	Weight	Dose per kilo	Total dose	Worms passed following treatment		Worms recovered post mortem		Anthelmintic efficacy against	
				Ascaridia	*Heterakis*	*Ascaridia*	*Heterakis*	*Ascaridia*	*Heterakis*
	Kilos.	*cc.*	*cc.*					*Per cent*	*Per cent*
738	1.133	0.882	1		0		207		0
708	0.935	1.07	1		0		160		0
Z(635)	1.844	0.542	1	5	0	0	167	100	0
XY	0.938	1.06	1	3	18	0	0	100	100
613	0.988	1.01	1	12	0	1	121	92.3	0
644	1.239	0.807	1	1	0	0	214	100	0
603	1.292	0.774	1		0		181		0
637	1.342	0.745	1		0		96		0
663	1.331	0.751	1	1	72	0	125	100	36.5
X	1.562	0.64	1	1	0	1	2	50	0
687	1.448	1.7	2		110		197		35.8
657	1.330	1.53	2		0		14		0
772	1.141	1.75	2		0		15		0
604	1.378	1.45	2	16	0	0	399	100	0
731	0.938	2.13	2		0		68		0
718	0.928	2.15	2	2	0	0	276	100	0
777	1.021	1.95	2		0		152		0
743	0.981	2.04	2	3	0	0	214	100	0
609	1.866	1.07	2		0		66		0
850	1.247	1.6	2	1	13	0	83	100	13.5
681	1.273	2.35	3	1	0	0	28	100	0
815	0.932	2.55	3	25	0	0	343	100	0
642	1.891	1.58	3	14	0	0	364	100	0
B	1.846	1.62	3	6	0	0	24	100	0
652	1.087	2.76	3	15	14	0	179	100	7.2
736	0.928	3.23	3	4	0	0	293	100	0
A(639)	1.269	2.36	3	3	2	0	29	100	6.4
685	1.367	2.19	3	6	0	0	333	100	0
665	1.539	1.94	3	3	0	0	96	100	0
859	0.994	3.01	3	3	1	0	28	100	3.4
678	1.296	4.29	6	2	0	0	214	100	0
			Totals	127	230	2	4688	98.4	4.7

a cloudy swelling of more than moderate intensity. In one dog, the drug apparently caused a very marked fatty degeneration, and in five of the remaining dogs, there was noted a slight to moderate fatty degeneration or infiltration. A well-marked central necrosis was present in the liver of one dog but this animal was suffering from distemper and showed a high temperature at the time of treatment. The lesions in this dog, therefore, were probably associated with the distemper and were not due to n-butylidene chloride.

In the kidneys of three of the dogs, the drug apparently produced a slight cloudy swelling of the epithelium of the tubules and a slight passive congestion. The kidneys of other dogs were apparently normal.

Cats.—In general, the cats used in the present tests tolerated the treatment without showing any reaction. Only three of the animals showed any gross lesions in the gastro-intestinal tract; in one case these lesions consisted of a slight gastritis and in the other two cases, of a very slight inflammation of the small intestine.

Histological changes in the livers and kidneys of the cats were more severe than those encountered in dogs. The majority of the cats showed cloudy swelling and passive congestion of the liver and a fatty degeneration which varied in degree from slight to severe. The cells immediately surrounding the central vein in the liver of several animals showed evidences of approaching necrosis, although there was in no case any indication of acute central necrosis, such as follows the administration of carbon tetrachloride and some other chlorinated hydrocarbons. This beginning necrosis, as indicated by karyorrhexis and karyolysis of nuclei, was not continuous in character but was confined to isolated groups of cells; the necrosis in some cases seemed to have been due to direct action of the drug on the liver cells but in other cases it was apparently caused by pressure of cells liberally engorged with fat.

The divergence of liver lesions in the cats, as compared with those in dogs, may possibly be accounted for in part by the fact that nearly all of the cats used in the present tests were young animals varying in age from three weeks to six months. None of the older cats showed severe liver lesions with the exception of those which had high temperatures at the time of treatment and were obviously suffering from distemper or other febrile diseases.

Absorption of chlorinated hydrocarbons from the intestinal tract is apparently greater in young animals than it is in older animals. As it has been found that carbon tetrachloride is far more toxic for puppies than it is for older dogs, it seems reasonable to assume that the tissues of young animals are less able to tolerate the toxic effects of chlorinated hydrocarbons than are the tissues of older animals.

The administration of n-butylidene chloride produced in many of the cats an acute toxic nephrosis. Here again, histological changes in the kidney were most marked in young animals.

Horses.—Wright et al.[13] reported on the microscopic pathology observed in the liver and kidneys of horses treated with n-butylidene chloride in doses of 0.3cc per kilogram of body weight. Following the administration of the drug at this dose rate, they found a moderately severe cloudy swelling of the liver with a slight deposition of fat, which in no case was well marked or extensive. The kidneys of two animals showed a hyperemia while the kidneys of a third animal, which did not receive a sufficient dose of purgative following the administration of the drug, showed an acute toxic nephrosis; the severe lesions in the kidney of this horse were apparently due in part to the fact that there was improper elimination and increased absorption of the drug.

Cattle.—Sections from calf 1758, treated with n-butylidene chloride in a dose of 0.5cc per kilogram of body weight, were studied. Histological changes in the liver consisted of considerable passive congestion and edema with a slight cloudy swelling which was most apparent in the cells immediately surrounding the central vein. There was no evidence of fatty infiltration or degeneration. The kidney sections revealed a severe toxic

nephrosis; there were marked cloudy swelling with extensive desquamation of the epithelium of the tubules, marked passive congestion, cast formation and dilatation of the tubules; a chronic glomerulo-nephritis was present.

Chickens.—None of the chickens used in these tests showed any gross lesions following the administration of n-butylidene chloride. Only the liver of chicken 678, which received n-butylidene chloride in a dose of 4.29cc per kilogram of body weight, was studied. The sections showed a marked passive congestion and a slight cloudy swelling.

Summary and Conclusions

In addition to those tests previously reported, this paper records the results of critical anthelmintic tests on dogs, cats, horses, cattle and chickens with a new anthelmintic, n-butylidene chloride.

N-Butylidene chloride, administered to dogs at a dose rate of 0.3cc per kilogram of body weight, in these tests showed an aggregate efficacy of 96.5% for the removal of ascarids, 100% for the removal of hookworms and 7.8% for the removal of whipworms.

N-Butylidene chloride, administered to cats at a dose rate of 0.3cc per kilogram of body weight, gave an aggregate efficacy of 90.4% for the removal of ascarids and 81.6% for the removal of hookworms. In 8 of 11 cats, the drug removed all hookworms present.

Tests previously reported show that n-butylidene chloride administered to horses at dose rates of 0.207cc to 0.333cc per kilogram of body weight, and followed in five hours by an adequate dose of raw linseed oil, is an effective treatment for the removal of *Strongylus* spp., *Poteriostomum* spp. and cylicostomes. Toxicity tests carried out on two horses, indicate that n-butylidene chloride has a safety factor for the horse of at least 14 times the therapeutic dose rate of 0.2cc per kilogram of body weight. This factor would probably be much higher where the drug is followed by an adequate dose of a suitable purgative as is recommended for routine administration. N-Butylidene chloride administered to one horse at a dose rate of 0.1cc per kilogram of body weight was 100% effective for the removal of *Oesophagodontus robustus* and *Oxyuris equi* and showed a fair degree of efficiency against *Strongylus* spp., and cylicostomes even though the animal in question did not receive an adequate dose of purgative. It seems probable that n-butylidene chloride could be recommended for administration at this dose rate provided the drug is followed by an adequate dose of raw linseed oil. However, additional tests are needed to establish this point.

Clinical tests with n-butylidene chloride gave satisfactory results and stopped losses in a herd of calves dying of parasitism. Critical tests carried out on two calves failed to give satisfactory results, apparently because of the difficulty in delivering the anthelmintic into the abomasum of ruminants. As similar results have been secured with other demonstrably effective anthelmintics, it would seem probable that if a satisfactory method of administration can be found, n-butylidene chloride may prove an efficient treatment for the removal of gastro-intestinal parasites of cattle.

N-Butylidene chloride administered to adult chickens in doses of 1cc to 6cc gave an aggregate efficacy of 98.4% for the removal of *Ascaridia lineata.* The drug in doses of 2cc or more removed all specimens of *Ascaridia* present in experimental birds. N-Butylidene chloride was not generally effective for the removal of *Heterakis gallinae,* showing an aggregate efficacy of only 4.7% against this species of worm.

Most of the animals used in these tests showed no gross lesions following the administration of n-butylidene chloride. Histological changes in the liver consisted in general of a slight to moderately severe cloudy swelling with or without fatty degeneration. The kidneys in many cases were normal; some showed histological changes varying in degree from passive congestion and a slight cloudy swelling to an acute nephrosis. Young animals showed kidney lesions which were relatively more severe than those found in older animals,

perhaps because of increased absorption of the drug in young animals. In no case where animals were normal at the time of treatment was there an acute central necrosis of the liver such as frequently follows the administration of carbon tetrachloride and some other chlorinated hydrocarbons.

BIBLIOGRAPHY

1. Daubney, R., 1930.—Miscellaneous experiments with anthelmintics, chiefly alkyl-chlorides, in the treatment of nematode infestations in sheep. Vet. J., Lond., (655), v. 86 (1), Jan., pp. 5-30.

2. Graybill, H. W.; and Beach, J. R., 1925.—Anthelmintic treatment for the removal of heterakids in fowls. Cornell Vet., Ithaca, v. 15 (1), Jan., pp. 21-36.

3. Hall, Maurice C., 1921.—Carbon tetrachlorid for the removal of parasitic worms, especially hookworms. J. Agric. Research, Dept. Agric., Wash., v. 21 (2), April 15, pp. 157-175.

4. Hall, Maurice C., 1928.—A theoretical and practical consideration of anthelmintics. (*In* De Lamar Lectures, 1927-1928. The Johns Hopkins University School of Hygiene and Public Health, Balt., pp. 1-23.)

5. Hall, Maurice C.; and Cram, Eloise B., 1925.—Carbon trichloride as an anthelmintic, and the relation of its solubility to anthelmintic efficacy. J. Agric. Research, Dept. Agric., Wash., v. 30 (10), May 15, pp. 949-953.

6. Hall, Maurice C.; and Shillinger, Jacob E., 1923.—Miscellaneous tests of carbon tetrachlorid as an anthelmintic. J. Agric. Research, Dept. Agric., Wash., v. 23 (3), Jan. 20, pp. 163-192.

7. Hall, Maurice C.; and Shillinger, Jacob E., 1925.—Tetrachlorethylene, a new anthelmintic for worms in dogs. N. Am. Vet., Chicago, v. 6 (9), Sept., pp. 41-52.

8. Ross, I. Clunies, 1931.—The passage of fluids through the ruminant stomach. Austral. Vet. J., v. 7 (4), Dec., pp. 122-134.

9. Stoll, Norman R., 1923.—Investigations on the control of hookworm disease. XV. An effective method of counting hookworm eggs in feces. Am. J. Hyg., Balt., v. 3 (1), Jan., pp. 59-70.

10. Stoll, Norman R.; and Hausheer, Walter C., 1926.—Concerning two options in dilution egg counting: small drop and displacement. Am. J. Hyg., Balt., v. 6, Mar. suppl., pp. 134-145.

11. Wester, J., 1930.—De slokdarmsleufreflex bij het rund. Tijdschr. v. Diergeneesk., Utrecht, v. 57 (3), 1 Feb., pp. 129-144.

12. Wright, Willard H.; Bozicevich, John; and Underwood, Paul C., 1931.—Critical experiments with carbon disulphide in the treatment of habronemiasis. J. Roy. Army Vet. Corps, Aldershot, v. 2 (2), Feb., pp. 66-70.

13. Wright, Willard H.; Raffensperger, H. B.; Bozicevich, John; Underwood, Paul C.; and Schaffer, Jacob M., 1931.—N-Butylidene chloride, a new drug for the treatment of equine strongylidosis. J. Agric. Research, Dept. Agric., Wash., v. 43 (4), Aug. 15, pp. 287-302.

14. Wright, Willard H.; and Schaffer, Jacob M., 1929.—Anthelmintic tests of chlorinated alkyl hydrocarbons and a correlation between the anthelmintic efficacy and the chemical composition. J. Parasitol., Urbana, Ill., v. 16 (2), Dec., pp. 107-108.

15. Wright, Willard H.; and Schaffer, Jacob M., 1932.—Critical anthelmintic tests of chlorinated alkyl hydrocarbons and a correlation between the anthelmintic efficacy, chemical structure and physical properties. Am. J. Hyg., Balt., v. 16 (2), Sept., pp. 325-428.

EPIDEMIC WAVES

The history of all infections which have developed into great human plagues is that they have traveled in great epidemic waves. The black death of the Middle centuries reached world-wide proportions and then subsided to lesser magnitude. Malaria caused more than 12,000,000 cases of sickness in Russia shortly after the world war. Leprosy at one time was a stupendous problem. Influenza swept the world in 1918 in a periodic wave of great magnitude. Tuberculosis appears to have reached a peak that had already begun to recede when the campaign against that disease became effective. It may be that undulant fever is on the upward trend in a threat of becoming parallel to these great plagues.—Andy Hall, M.D., Director Illinois Health Department.

VETERINARIANS IN RABIES CONTROL

A program of rabies prevention will have a strong appeal to stock raisers and farmers because of the great economic losses involved. Pointing out that the greatest danger comes from stray dogs will stimulate greater alertness in controlling these roving creatures. Reminding country folk that rabies is primarily a spring-time infection will tend to scotch outbreaks of the disease before epizootics become general. Educational activities along these lines, appropriately timed, would probably result in greater control over rabies than invoking the quarantine law. Veterinarians are in a particularly advantageous position to participate in a program of this kind.—Andy Hall, M.D., Director Illinois Health Department.

Observations on Bovine Mastitis

By F. B. HADLEY, Madison, Wisconsin
Department of Veterinary Science, University of Wisconsin

WHEN the cow's udder becomes infected with bacteria, as it frequently does, milk secretion is decreased. The resulting disturbance is properly termed mastitis, colloquially garget. The disease may be rapid or slow in course; mild or severe in intensity; acute or chronic in duration. The lesions may be pathognomic (clinical mastitis) or so obscure as to be undetectable (latent mastitis).

Cows in which the infection was experimentally induced in three quarters by introduction of pure cultures of certain streptococci did not develop the disease in the control quarter. In fact, bacteriological examination failed to demonstrate that the organism became even a temporary inhabitant of the latter, although plenty of opportunity was given to transmit it on the milkers' hands.

Milk normal in appearance may be teeming with disease-producing streptococci, while that so changed in appearance that it resembles serum may be practically free from bacteria of all kinds even though the infection was caused by a virulent streptococcus.

The milk from cows with mastitis may change from time to time in both appearance and reaction with the progress of the inflammation and the kind of organism responsible.

Different organisms may induce identical or at least similar symptoms, so the symptoms cannot be relied upon as a means of determining the kind of organsim responsible for the disturbance.

Organisms pathogenic for the cow's udder must usually gain entrance by way of the teat canal, as inoculations by way of the broken skin, eye or mouth failed to induce mastitis.

The number of streptococci in mastitis milk may be so enormous as to be almost beyond belief. In one case the count was 960,000,000 per cubic centimeter.

The diagnosis of mastitis can be made best by applying two series of tests, viz., (1) stable tests and (2) laboratory tests. The former consist of a physical examination of each quarter of the *empty* udder, the use of the strip cup, and the use of a color indicator. The laboratory tests include a bacteriological examination for both the number and kinds of bacteria, and a test to determine the actual chemical reaction of the milk.

The stable tests offer ready means of detecting mastitis and if regularly used give an approximately correct picture of the herd in so far as the condition of the udder is concerned.

One application of the stable tests should afford sufficient information upon which to make a tentative diagnosis, but the final diagnosis, as well as the prognosis, should rest upon the evidence obtainable from both series.

Reliance should not be placed on the mere demonstration of either long-chained or short-chained streptococci in milk as a means of diagnosis. However, clinical symptoms are five times more likely to develop in cows shedding streptococci than in those whose milk does not contain them.

One reaction to any test is not sufficient to justify condemning a cow. This implies that the actual condition of the udder can be determined often only by several tests or by a number of examinations.

An animal which reacts to two or more of the stable tests, or to two of the laboratory tests, or better yet, to one or more from each series, undoubtedly has mastitis.

Experimental infections superimposed on earlier but quiescent natural infections in the same and other quarters were not influenced in intensity or duration. These results indicate that practically no local or general immunity is established from an attack of infectious mastitis.

Combined Soak Stall and Operating Stocks for Cows

By JOHN P. TURNER, Washington, D. C.

A SEVERE outbreak of "foot rot" (necrobacillosis) in a large herd of Holstein-Friesian cows during the summer of 1931 required the building of the crude stocks and soak stall herein described. As many as 25 or 30 cows were affected at a time. Dressing the feet by the ordinary method of holding the foot (mostly hind) by means of a pole and two "able bodied men," as described in the text books, was not practicable. The able bodied men are scarce. Then, again, the feet cannot be held steady enough to operate upon when some pain is experienced by the cow. Inability to properly apply foot dressings without secure restraint is another reason for the use of stocks.

These stocks were built by a farm foreman, using cedar posts for the left side of the stocks, and the wall of a manure-yard was used as the right side. The posts should be eight inches square, and locust posts would be better. These posts were sunk one and a half feet in concrete at the side of a cement soak stall 28 inches wide, five inches deep and 5½ feet long, with a cement ramp for drainage extending 2 feet from the side of the stall and 6 feet back of it.

Three 2 in. by 6 in. pieces were bolted to the cedar posts. This stock would be more useful if the middle plank was movable, as it is in the way when operating on the body of the cow and it also is slightly in the way of the single tree of the sling. This middle plank is necessary to keep the cow from dodging out of the stock before she is secured.

The stanchion is set into a hinged gate, the hinges being bolted into the front post. In the illustration the stanchion gate sets too high. It should not be more than two inches from the top of the soak stall. The proper position is shown in the drawing. The reason for this change is that some cows will get stubborn and lie down in the sling during an operation and in some cases will choke unless released. Lowering the gate stanchion close to the top of the soak stall obviates this. It is best to have a gate stanchion in order that cows can be driven through when the operation is finished, though in practice they usually back out when released.

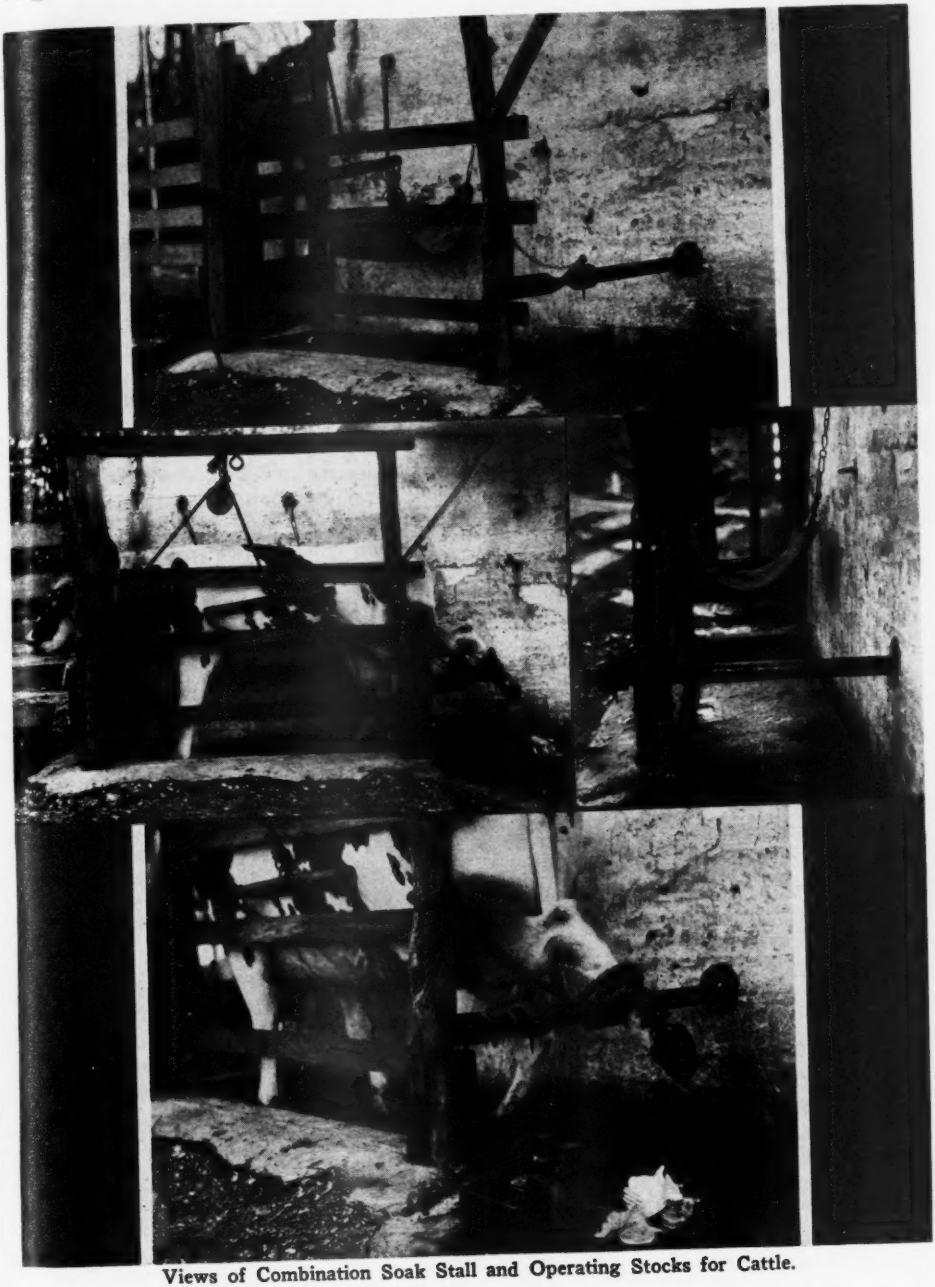
The tops of the cedar posts are connected with two 2 in. by 4 in. pieces, reinforced with a piece of 4 in. angle iron with a hole drilled through it for the bolt to support the slings. Two bolts with ring ends are cemented into the wall, these being 28 in. apart, and to these are attached the hooks of the sling chains.

The sling is of heavy canvas 28 in. wide and three feet long. This canvas belt is reinforced by a leather belt slipped inside each end; these belts are riveted to the canvas. A 4-inch ring is attached to the end of these leather belts and the chains attached to these rings by means of patent open links. At the other end of the sling is attached a single tree connected to the rings of the sling by the patent open links.

An inch rope and a single pulley is used in drawing the belt firmly to the cow's abdomen. Another ring is shown in the wall to the rear of those supporting the sling. This is used to tie the cow in case the right front foot is to be operated upon; in which case the cow is backed into the stall and head tied to this ring and the rear post.

The most essential and important part of this stock is the iron arm to support the pipe set in the wall. This is made of three and a half inch by half inch iron and is 14 inches from the ground to where it is bent to the rear. In this perpendicular part there are three bolts with nuts going through the rear post. This iron

arm extends horizontally 23 inches and is given a half turn to make the ring through which is inserted the iron pipe. This ring is 22 inches from the ground.



Views of Combination Soak Stall and Operating Stocks for Cattle.

A hole is bored through this ring and iron pipe through which is inserted a pin with chain attachment to prevent turning of the pipe when the cow's foot is tied to it. This iron pipe is 2¼ inches outside diameter. A 6-inch piece of iron pipe slightly larger is cemented into the wall to receive the two and one-quarter inch pipe.

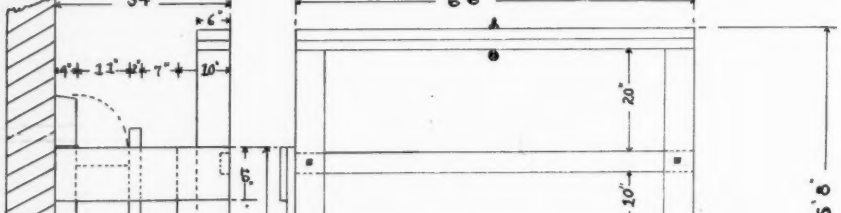
The cow is led into the stall, stanchioned, and the sling dropped under her body and drawn firmly to her abdomen. A 1-inch cotton rope is looped above the fetlock and the foot drawn over the iron bar and tied very tightly by means of a figure of eight tie. The end of the rope is tied to the rear post. The cow is now under proper control for any minor operation on the foot.

The foot is thoroughly scrubbed with hot water and disinfectant and novacaine injected if the operation involves the deeper structures. Such operations as punctured nail wounds, false soles due to foot rot, deformed feet, especially "in growing" walls of cows and bulls, are done with ease, safety and comfort to both operator and patient.

Amputation of the claw has not been attempted in these stocks owing to the fact that some cows will lie down and hang pendulously in the sling until the foot is released from the iron bar. For this reason when a claw is to be amputated, the cow is cast with English hopples, the foot to be operated is released and bound to a 2 in. by 6 in. plank. The operation is performed under local anesthesia and a firm, tight, waterproof bandage applied.

Cows not requiring operative attention are put in this soak stall (which holds 25 gallons of a strong solution of cupric sulphate in vinegar) for 30 minutes. By this means quite a large number of cows can be treated during the day. The slings are not used for these cases. During this outbreak all cows were driven through a shallow trough at the entrance of each barn, this trough being made the width of the entrance of the barn and filled with a strong solution of cupric sulphate, which is changed three times a week.

In treating punctured soles and feet badly diseased from foot rot, the utmost attention is paid to cleaning the feet, paring away diseased horn, opening fistulous tracts in general and getting the soles smooth to prevent future infection. Oakum saturated with a strong copper sulphate and vinegar solution is packed between the claws in order to spread them widely apart, tar and oakum applied to the soles and a generous appli-



Plan of Soak Stall and Operating Stocks for Cattle.

cation of cotton is wrapped around the pastern after it has been dusted with talcum powder. A 3-inch bandage of canton flannel four yards long is then applied, making the first turn between the claws and then around the pastern and between and around the toes in a figure of eight until the claws are practically covered by the bandage, which is then covered with tar to exclude moisture. This bandage if tightly applied will remain in place a week and rarely needs replacing.

This stock would be more available for general operative work if four posts were utilized in its construction, instead of using a side wall and an iron brace similar to that used on the left hind post be provided for the right hind post. This iron would have to be firmly attached to another post firmly set in cement and two feet back of the right hind post.

SANITATION CHIEF RELIANCE IN DISEASE CONTROL

More than 3,000 years ago Moses stated most of the basic sanitary laws by which we today prevent and control the spread of disease. It is doubtful if Moses would have recognized a microbe if one came up and spoke to him. However, it was apparent that if the sick came in contact with others, often the illness was spread. Even the materials used or contaminated were found to be a source of danger. Read Deuteronomy and Leviticus for a detailed account of the methods of disease control before the Christian era, and hundreds of years before microscopes and microbes were dreamed of.

In the last 50 years the discovery of many valuable vaccines, serums, and other biologics has partly blinded us to the idea that these products essentially are merely aids to sanitation and are not in themselves an answer to our problems. Maryland stockmen do not hesitate to use these aids in the control of hog cholera—our most costly swine disease—when it is necessary. But the majority have learned that feeding cholera-infected bones, rinds, and scraps of pork in the kitchen refuse is responsible for about 85% of the outbreaks, and that new stock and sick, roving hogs cause about 10%. Proper feeding and proper fencing constitute prevention of most cholera outbreaks here and permit pork profits.

Mark Welsh.

College Park, Md.

HOG CHOLERA CONTROL IN MARYLAND

Several years ago, the Maryland State Board of Agriculture in attempting to control the then prevalent disease of hog cholera, concluded that control of the virus was essential to any such plan. In promoting the regulations, they confined the use of virus to veterinarians. It was recognized that even in the hands of those trained and experienced in treatment of animal disease, this product had potent possibilities of causing the disease it was desired to prevent. The wisdom of restricting virus to competent hands only, has been amply proved. Yet, no hardship has been worked on those who feel it is desirable to employ the serum-virus treatment. It is, of course, necessary that adequate sanitary precautions be taken by the user, to prevent the virus from being transmitted to neighboring premises. These precautions would most likely be taken by competent men in any case.

Together with control of the virus, the Maryland Plan for Control of Hog Cholera has been promoted. This is essentially a sanitary plan for prevention of cholera by sanitary procedures. In past years the soundness of these policies has become most evident. In the years immediately preceding the adoption of these measures, approximately 72 hogs per thousand were reported lost annually by cholera. For the last few years, this loss has been reduced to about 18 per thousand. As the proof of the pudding is in the eating, the virtue of a plan is in its results.

College Park, Maryland. Mark Welsh.

Eosinophilia in the Dog

By MATTHEW G. and JOHN J. HANSON, New Brunswick, New Jersey

IN several articles that appeared in the North American Veterinarian we discussed in association with Dr. M. L. Morris in some detail the value of the Schilling blood picture as related to small animals. These papers were more general in scope and stressed the value of the hemogram as an aid to clinical diagnosis. Less attention was paid to the individual cells, their staining reactions, morphology, the finer nuclear changes and numerous other factors that may interest the hematologist and others who may desire to study these questions in detail.

Schilling's work, as outlined in his book "The Blood Picture," is related primarily to man in its theoretical considerations; the student of animal hematology who uses his methods and examples will often be confused. Many factors that he outlines as important may be absent, and again others may arise which are of significance that he does not cover in his work. This will at times be a source of indecision regarding a conclusion to be drawn from a specific blood picture.

In our earlier papers we endeavored to arouse interest in the blood picture in the dog and its importance to the clinician. We mentioned the use of Wright's stain, because of its simplicity, as the method of staining to be used. But for one who wishes to carry on a detailed study of problems of research, based on the practical and theoretical considerations of Schilling, the Giemsa stain and methods for its use as outlined by Schilling should be followed in minute detail, since many important cellular changes will be missed if Wright's stain is used.

As the work in our laboratory deals with both man and animal, we have before us both sides of the picture. Balanced one against the other they are often an aid towards reaching a conclusion in relation to a specific blood picture, in an animal or a group. This and later papers we hope will be of aid to the worker who is interested, but whose studies will be entirely devoted to the dog. One of the most interesting cells in the blood of both man and animal is the eosinophile. In our early endeavors, following our experience with this cell in man, we found that often the picture in man was of no index of this cell's importance when applied to the dog.

Schilling states that in man we have an eosinophilia due to worms wherever located. Those who do a great number of counts on small animals will be surprised by the almost complete absence of this sign in dogs with all degrees of parasitic infestation. Schilling quotes Staeubli in this statement: "that an eosinophilia may dwindle to an aneosinophilia (insufficiency) because of over-infestation. We are interested in this statement, but at this time would say that this is a field for further study.

The figures outlined below we believe will be of interest, since it compares 100 blood counts done on dogs with 100 blood counts performed upon man and covering about the same period of time. There has been no attempt made to classify them as to age, sex, etc., but only on the basis of 200 counts passing through our laboratory.

Man	Dog
100 counts	100 counts
10,000 cells counted	10,000 cells counted
Eosinophiles 1.37%	Eosinophiles 0.5%

The above figures show the dog an animal commonly infested with parasites, compared with man who in this part of the country being comparatively free

from this type of infection, showing a higher percentage of eosinophiles.

The comparison that follows covers four cases of trichinosis in man, with six cases of filariasis in the dog, although both diseases are different clinical entities both produce a marked eosinophilia in man.

Trichinosis in Man

Leucocyte count	Case	Eosinophiles
8,900	No. 1	44%
12,400	No. 2	36%
13,000	No. 3	44%
12,000	No. 4	31%

Filariasis in the Dog

Leucocyte count	Case	Eosinophiles
17,400	No. 1	0.%
8,700	No. 2	0.%
10,650	No. 3	0.%
12,450	No. 4	2.%
11,000	No. 5	0.%
12,240	No. 6	0.%

Searles reports in his experimental work of the cutaneous infestation of dogs with the hookworm *Ancylostoma caninum*, eosinophila of 17% to 42% on the 10th, to 14th, day. In our hundreds of counts we have only twice counted the blood of a dog, showing this many eosinophiles, regardless of the degree of infestation with worms. The difference may be due to the fact that our cases have suffered with parasites for long periods of time, perhaps for months and years. The above was cited to present the difference between the experimental animal and the so-called clinical case.

In man the appearance of eosinophiles following infections is considered one of the first favorable blood findings. In dogs we have searched for it in all types of infectious processes such as distemper, pneumonia, bacteremia cases, etc., that recovered, without definite findings. Skin troubles of all types, even when extensive, fail to produce an increase in eosinophiles as we expected from our work with man. The blood of dogs studied after the injection of anti-distemper serum in our series showed no increase in eosinophiles.

The eosinophilic cell when typical is easily identified; they are round and of about the same size as the segment neutrophile, the red granules filling the cell being especially prominent. They show the two or three oblong or oval nuclear strands, which at times may be of unequal size. A cell found in dogs suffering from pathological conditions has aroused our interest; for want of a better term we call it the atypical eosinophile. It is of about the same size as the eosinophile, with litle or no change in the nuclear portion of the cell, the granules take the acidophilic fraction of the stain with indifference, when compared with the typical cell. Sometimes there is quite some swelling and fragmentation of the cell body, the presence of vacuoles is quite common. These cells are often similar to the pseudo-eosinophiles found in other animals.

Kanthack has found that the pseudo-eosinophile granules of the rabbit may be made to show a higher degree of acidophilic reaction to stain by the injection of vaccines in doses that developed immunity. We have noted in animals who have received tissue vaccines that they show the so-called atypical eosinophile in their blood. This has raised the question that this is an increase acidophilic staining tendency in the neutrophile granules as noted by Ewing and others in certain infectious diseases in man. Our experience with this cell is not sufficient to form a definite opinion as to its proper classification. The literature consulted is indefinite regarding this cell in dogs.

Bibliography

Schilling, 1926. The Blood Picture.

Searles, 1929. The reaction and susceptibility of dogs of different ages to cutaneous infection with the dog hookworm, *Ancylostoma Caninum*. *Amer. Jour. Hyg.*, 10, 683-704.

Kanthack, 1894. *Jour. of Physiology*, Vol. 17.

Ewing, 1901. Clinical Pathology of the Blood.

Note. We wish to thank the veterinarians who supplied the clinical material that formed the basis for this paper.

Treatment for Retained Fetal Membranes

By JULIUS MAURER, White Plains, New York

THE treatment for retention of the fetal membranes always has been carried out by many different methods. Each veterinarian in treating this condition has applied more or less his individual method. Many practitioners are of the opinion that the afterbirth should be removed as soon as possible. Others are positively against such a procedure, and leave such patients untreated. Then again there are many who do not remove the placenta, but douche the uterus or introduce disinfectants in powder or tablet form, into it.

When I was a student and later assistant —that was eight and six years ago—it was the practice to remove the fetal membranes early and then to follow it with a series of douchings. The uterus was thoroughly douched and massaged once a day—in bad cases twice a day—for as long as 10 to 14 days after parturition. This procedure required much time and patience, and was also very expensive for the owner. Moreover, it did not always have the desired result. Only occasionally was it possible by this method to remove all of the antiseptic solution or to prevent metritis.

The douchings often prevented the contraction of the uterus in the natural, rapid manner, and therefore were reduced to the smallest possible number. The uterus was still cleaned, but with only a small amount of antiseptic solution, after which a mixture of oil and charcoal was injected or sticks of charcoal were put in. This led to the "dry treatment" which began to interest practitioners more and more. According to this method, the afterbirth was first removed, and then the liquid in the uterus was siphoned out, with a uterine tube, and charcoal or a disinfectant was introduced. The treatment was repeated at intervals of three to four days, as necessary, and the uterus was well massaged on each occasion.

All these different methods are in use today. There are veterinarians who still treat by the douching system and still more who combine both the uterus douching and the dry treatment, although the dry treatment has the majority of adherents. There yet remain only a few veterinarians who do not treat cases of retained fetal membranes at all; who oppose any attempt to influence the natural healing process.

Although I describe in the following a line of treatment that has served me well in a number of cases recently I want it understood that I would consider it absolutely wrong to prescribe a hard and fast rule of one method for all cases. Each patient is a distinct case—no two can ever be exactly alike. As each case comes before us we should consider carefully which method of treatment will best meet the individual need.

Object of Treatment

Generally speaking, we want to aid and support the natural healing process as much as possible. We aspire to prevent uterine inflammation and sepsis; primarily to keep the animal alive and restore health. In addition we desire that the patient shall retain a good appetite, so that she will not lose weight; that the milk production be decreased as little as possible, and that the fertility of the animal be preserved. Further there is the matter of dairy hygiene to be considered. It is not possible in all stables to separate the freshening cows from the others, and since the odor from a case of retained placenta during the discharge period is extremely objectionable, not to mention the accompanying fly pest during the summer time, and the possibility of causing mastitis or other infections. It seems logical that the uterus should be cleaned as soon as possible. The shortening of the process of resolution is beneficial not only to the patient but to all the other animals in the stable, and their caretakers.

Cattle Owners Skeptical

When I began my practice in this section two years ago, I was rarely called to patients with retained fetal membranes. This puzzled me considerably, as the cows around here are, for the most part, of very good quality, of high value to their owners and well worth treating. Upon inquiry I learned that my predecessor, an old veterinarian, made it an invariable practice to remove the afterbirth immediately and that a number of serious complications had resulted. This, of course, did not sound very encouraging for me, but nevertheless, in time I was given the opportunity to treat cases of retention of the fetal membranes. There are no farmer-clients in my practice now who object when I suggest treatment for a cow with retained afterbirth, and there is not one who can say that either in spite of, or in consequence of my treatment, that he has lost an animal. It was very important for me to establish a treatment which would promise the greatest success possible. I knew that it would be only by practical demonstration that I could remove the deep-seated and well-justified distrust of the animal owners in this matter.

A New Treatment

I followed with a great deal of interest, among other subjects, the arguments in the foreign veterinary press on the use of the Chinosol and the Parenchymatol-Yeast-Pepsin-Charcoal-Capsules, called for short "Pepcapsules," in cases of retained afterbirth. In the German veterinary literature of the year 1930, this matter was taken up and argued for and against in many sharp debates by the leading veterinarians. Many practitioners at that time recommended the "Pepcapsules," but did not esteem the "Chinosol" very highly. Others again, especially those who had already worked with Chinosol for many years, regarded the "Pepcapsules" as a new preparation and were skeptical as to its good qualities. While I was following these points of controversy, I became convinced that both preparations must possess excellent qualities, for I felt sure that the advocates of both must have been thoroughly convinced, if they could show such fighting spirit in these discussions. I was acquainted with Chinosol, as I had used it in cases of uterine diseases, and also in such other cases of sickness as gastro-enteritis, coccidiosis, influenza and distemper. Chinosol had given me good service. The pepcapsules were known to me only through the literature which I had studied but their combination seemed to me good.

The name of the Parenchymatol-Yeast-Pepsin-Charcoal-Capsules, which are made by the firm "Atarost" of Rostock, Germany, in itself explains the content of these uterine capsules.

Parenchymatol is an excellent non-irritating disinfectant. It has strong bactericidal qualities and is a good stimulant.

The *Yeast* used is a highly active one. It stimulates the defense mechanism and destroys pathogenic micro-organisms.

Pepsin is a digesting enzyme. It not only dissolves the elastic gelatin cover of the capsules, in a very short time, but acts with the same effect on the afterbirth. Moreover it does not injure the wall of the uterus because the digestive effect of this enzyme is not exerted on living tissue. In cases of retention of the placenta, if the fetal membranes have an extraordinarly fast hold on the cotyledons, pepsin has a loosening effect. I consider this very important as no other uterine capsules, now on the market, possess this attribute.

Charcoal has a great capacity for absorbing odors and liquids and is an antiferment. This colloidal therapy is used to remove toxins.

Technique

The treatment of the retained afterbirth is carried out as follows: In the first place, I instruct all my clients to call me when the placenta has not been expelled within twenty-four hours after the birth. After the usual thorough cleaning and disinfecting, on which I lay great stress, I try to remove the afterbirth. If this is easy, I remove it as completely as possible, and then insert from two to four pepcapsules into the uterus. The capsules dissolve within a few minutes and the contents spread rapidly over the entire

inner surface of the uterine wall. On my next visit, usually in three or four days, I find the uterus shrunken markedly. A massage per rectum and the insertion of two or three more of the pepcapsules finishes the treatment in these cases. In my experience *such patients have never developed metritis and have never shown signs of any general disturbance.*

However, if the afterbirth should adhere too firmly to the cotyledons, I do not attempt to remove it, because a removal forced too early, to my way of thinking, does more harm than good. In such cases, I insert four or five pepcapsules, distributing them as carefully as possible between the membranes and the uterine wall. Then I wait three days, after which time I can effect the removal quite readily, if the afterbirth has not already been discharged in the meantime, which frequently happens. Should there be much liquid in the uterus, I drain it off with a uterine tube and then insert three more capsules. On my next and last visit I do the same. In following this procedure, I avoid all douchings.

Successful in Preventing Metritis

Of course in practice one does not always get cases of retained afterbirth at the end of the first 24 hours. I have treated cows that were in a most miserable condition, where parturition had occurred one, two or three weeks before and the afterbirth was putrid and torn into many pieces, the uterus was inflamed, and the patient reduced to skin and bones. In spite of this hopeless condition, my treatment so far without exception brought unexpected success. With such cows the treatments were repeated oftener and more capsules were used. In some of the very severe cases, I resorted to the Chinosol therapy and douching to wash out all the decomposed detritis of the afterbirth, pus and serum before I put the pepcapsules in the uterus. General disturbances such as the appearance of sepsis, was always overcome by repeated intravenous injections of Cejodyl. *Since I have used the Parenchymatol - Yeast - Pepsin - Charcoal - Capsules, injecting Cejodyl in very severe cases, I have not lost a single patient from retained afterbirth. In the same manner I obtain the best of results in the treatment of metritis.* Cejodyl is a sterile cer-iodide solution. It consists of cerium iodide, arsenic iodide, monomethyl-disodium-arsenate and an organic acid. It, too, is an Atarost preparation.

A Severe Test

Statistics are usually tedious, but as indicative of the test to which this new treatment has been put I will say that during the past two years I have used it on ten mares and more than seventy cows suffering from retained placentae. Among these were fourteen cases which were apparently hopeless, but nevertheless recovery ensued. I strongly oppose the practice of some veterinarians who wait until the third day after parturition before starting treatment. After the expiration of so much time, the afterbirth shows marked decomposition, and toxins have already been absorbed that are very injurious to the patient. It seems far better to start treatment as soon as possible, say after twenty-four hours, and remove the afterbirth, if it can be done easily, and disinfect the uterus before great damage is done to it by the infection inevitable in such cases. In this manner the natural healing process is aided and a cure is started and effected where nature alone is unable to cope with the situation.

Conclusions

Two important facts deserve special emphasis. In the treatment of retained afterodor caused by the decay of the afterbirth is entirely obviated because the uterus cleans itself with extraordinary rapidity, and thus the offensive discharge period is considerably shortened. This, of course, is of decided advantage both to the men in charge and to the other animals in the stable. Furthermore, I have followed with interest the general condition of my patients that suffered from retention of the placenta or metritis and I have learned that—with few exceptions—they conceived again within a short time. The exceptions suffered from other diseases, such as tuberculosis, which caused the sterility.

Treating metritis and retained afterbirth by means of the pepcapsules is both convenient and clean. It saves me much time and the owner of the animal much money. Moreover, the results have been better than I could obtain by any other treatment or with any other medicine.

It is important to note also that this treatment is by far the cheapest one for two reasons. First, I can limit my visits to a minimum and secondly, because the parenchymatol - Yeast - Pepsin - Charcoal - Capsules, though larger than other uterine capsules and despite their excellent quality, are less expensive than any other preparation used for this purpose.

Useful in Small Animal Practice

I regret I have had no occasion to try these pepcapsules on dogs. O. J. Thedens of Auckland, New Zealand, writes that he has used them on bitches with the best of results. I have before me reports to the same import from Germany, Switzerland, Denmark, Sweden, Holland, New Zealand and Mexico. Knowledge of the pepcapsules has spread throughout all these countries, and I find agreement everywhere that this preparation is the best that has been introduced up to the present time for treatment of retained afterbirth and metritis.

FATTY INFILTRATION OF THE LIVER IN CATTLE*

In 30 to 50% of the beef cattle slaughtered, sharply circumscribed areas are found in perfectly normal liver. They are about the size of a penny, are yellowish-gray in color, irregularly round and somewhat protruding upon the surface. They do not reach down very deep into the tissue. They are foci of fatty infiltration. They may be observed in all meat producing animals. From the observation that bloodvessels in the center of the fatty infiltrated areas communicate with other organs, and the fact that these bloodvessels enter the liver from other organs, it is concluded that the blood must enter the liver under a higher pressure than exists ordinarily in the portal artery. This rise in blood-pressure in one of the branches of the portal artery is sufficient to cause fatty infiltration due to increased storage of fat from the blood, and the lowered fat combustion. Hormonal and other processes play a rôle also.

*Bugge, G., and Hemmert-Halswick, A. 1932. Zur herdförmigen Verfettung der Leber beim Rinde. (Circumscribed fatty infiltration of the liver in cattle.) Berl. Tierärztl. Wchnschr. 48(41):661-662. Abst. by F. Volkmar.

ABORTION DISEASE CONTROL ON THE RANGE

ABORTION disease control in cattle under range conditions does not lend itself to the detailed sanitary rules as recommended by authorities for small farm conditions. Some immunizing agent must be developed by research workers which will successfully control this disease. Present methods of immunization are inadequate and of doubtful value. This disease is of extreme economic importance and is worthy of more experimentation.

The cattle industry is vital to the range country in the western states. There is nothing else to do with the land. One of the most important limiting factors in the production of range cattle is infectious abortion. No other disease causes as great loss in range cattle as does this disease. The loss of a calf means that the cow is out of production for a year or possibly longer and the feed she has eaten is wasted. If the cow becomes a non-breeder she may be marketed at a sacrifice much to the disgust of the owner. The cattleman is then a fit subject for the nostrum peddler. And the amount of money expended for abortion cures is not small. This is another direct loss to the range cattle industry as a result of abortion disease.

The control measures for abortion disease as applied on well-equipped eastern farms are not practicable under range conditions. The lack of barns and the nonexistence of fences prevents the maintenance of separate herds. The isolation of the aborting cow cannot be put into practice because the owner probably will not know she has aborted until he dis-

covers she is not followed by a calf. The dead calf and infected placenta are not given proper disposal because they are not usually found. The sick cow receives no treatment because there is not a veterinarian within a hundred miles of her. The bulls have plenty of opportunity to spread the disease as they run with the herd at all times. Cattle from several ranches mingle in a common herd and in general separate herds are not and cannot be maintained under present conditions.

Providing the present methods of testing cattle for infectious abortion are not questioned as to accuracy, the reacting cattle may be "weeded" out of the herd. But the question arises as to what is to be done with the reactors? Not all cows that react abort; many of them are breeders. Not all cows that react spread the disease. In as much as it is impracticable to maintain a separate herd on the ordinary ranch the next best method is to slaughter the reactors. Whether right or wrong, the cattlemen are not willing to accept this method. A more practical method of control must be devised if the cooperation of the cattlemen is to be secured.

Present results from the various immunizing agents are not satisfactory. There are considerable dangers attending the use of a live culture in a herd of cattle. If the disease is not already there certainly it is thereafter. Optimistic authorities credit this live culture vaccine with only 50% efficiency. And as for the bacterin, there are many cases on record where the disease has abated after its use; there are also many cases on record where the disease has abated when nothing was used. More knowledge of the disease, more research work and more experimental work are needed in the development of a practical method of controlling abortion disease with a successful immunizing agent in the forefront.

Those experiment stations that have the initiative and the available funds to work on the abortion problem are to be congratulated and encouraged. Many states are doing nothing and are satisfied to get along the best they can until some other state or the Federal government works out this problem. It may be a matter of educating people to the realization of a necessity of experimental work. Research work on abortion disease does not lend itself to quick conclusions. Experimental work may be expensive and the amount of equipment necessarily large but the cost of such work is insignificant when compared with the immense loss to the cattle industry from abortion.

The elimination of abortion losses would be a great stimulus to the range cattle industry. Because of it many cattle men are reluctant to buy purebred or highgrade cows. If these cattle owners could have the assurance that immunity could actually be conferred by some biological product it would mean a greater confidence in the industry and thousands of dollars in their pockets. It would mean greater cooperation among cattlemen and livestock sanitary officials. Livestock organizations and publications would be less critical of the regulatory forces. There are millions of cattle roaming over the prairies and hills in the range country and the possibilities for the sale of such a product can hardly be imagined.

Most certainly, the present control methods should not be relaxed and the campaign should go on wherever the methods are applicable. But the ranchman is handicapped by the lack of barns and other equipment. His cattle are not closely observed. The cattle are wild and not easily handled. Specific treatment of the individual is difficult. They are watered by running streams and dams. The dead calves may never be found. Veterinary service is seldom available at a cost of less than the value of the animal. All these factors contribute to the difficulty of solving the problem. Possibly it is unreasonable to expect the development of such an efficient immunizing agent against infectious abortion as now exists for blackleg or hog cholera but at least, there is no harm in being hopeful.

Brookings, S. D. G. S. Weaver.

The Egyptians kept cattle for the production of milk as early as 3500 B. C. Reference to milk and milk products in the Bible are so incidental as to indicate its common use from prehistoric times.

Treatment for the elimination of bots and other internal parasites of 21 horses of the military stables of the University of Illinois resulted in an average monthly gain of 46 pounds per horse the first two months following treatment, the university reports. One horse which was to have been killed because of its unthrifty condition gained 255 pounds in weight in the 6 months following treatment, and proved to be one of the best mounts in the stables.

HORSE PARASITE CONTROL WORK

An average of one out of every six horses in Illinois was treated for bots and round-worms in 1932. In all 136,235 horses in 66 counties were treated in Horse Parasite Control Project of the College of Agriculture, University of Illinois, cooperating with state and Federal agencies. Two hundred and four veterinarians participated in the project; treating an average of 632 horses each. In 1930-31 approximately 8,500 head of horses were treated for bots and ascarids by 16 veterinarians in eight counties. The results obtained were encouraging to the owners. In 1931-32 the work was continued in the eight counties in which it was inaugurated and 58 additional counties joined in the work.

Ninety per cent of the preliminary reports are favorable. In some horses, improvement has been noted 30 to 60 days after treatment. Treated horses worked better, were more easily handled, and stood the heat of summer better. Horses that fail to show improvement should be studied to determine the cause or causes involved. A correct diagnosis eliminates the guesswork from treatment.

TOXIC FUMES KILL UNHATCHED CHICKS*

The death of 71 chicken-embryos on the 19th day in an incubator was traced by circumstantial evidence to toxic fumes emanating from varnish used in a room below on that day. Tests upon baby chicks, carried out with butyl-acetate and E 13, the volatile substances contained in the varnish, confirmed the suspicion of their toxicity upon the chicks. The symptoms observed were: Narcosis with the former; with the latter, partial loss of equilibrium and death of one chicken two days after the experiment. Older chicks exhibited greater resistance to the toxin.

PARATYPHUS IN CATTLE†

In contradistinction to man in whom two types of paratyphus are recognized,—the typhose form or paratyphus in the narrower sense, and the gastro-enteritic form or meat-poisoning,—the Gaertner infection of cattle is represented solely by the typhose form of paratyphus. Thus resulted the term "paratyphus of cattle." Anatomically the liver exhibits grayish-yellowish miliary areas. The spleen is enlarged and of rubberlike consistency. The kidneys are light in color and show petechia in the cortical part. Enteritis is an almost constant accompanying phenomenon. Mammitis, metritis and pneumonia are very frequently encountered in mature cattle. Histologically the parenchyma (paratyphus-nodules) and the venes (endophlebitis paratyphosa) of the liver, spleen, lymphnodes, and bone-marrow show miliary necrobiosis and histocytary granulations.

---

*Schmid, G. 1930. Ueber eine Vergiftung von Kücken mit flüchtigen Stoffen. (Poisoning of baby-chicks with volatile matter.) Archiv für Geflügelkunde 4(5):177-182. Abst. by F. Volkmar.

† Hemmert—Halswick, A. 1932. Zur pathologischen Anatomie des Paratyphus beim Rinde. (Pathology of paratyphus in cattle.) Arch. Tierheilkunde 65(2):117-139. Abst. by F. Volkmar.

Guarding Milk Supplies in Small Municipalities

Radio Address by JOHN F. MILLER, D. V. M., Albany, New York
Bureau of Milk Sanitation State Department of Health

ONE of the health problems which confronts health officials, but is not appreciated by many, is that of safeguarding the milk supply in small communities.

The methods of safeguarding the milk supplies have probably received more study in recent years than any other phase of public health administration. The need for such studies is apparent when one considers the value of milk as a food, the history of milkborne outbreaks and the various methods used in the protection of this important food.

There are few food problems which present so many difficulties as that of furnishing to customers, at a reasonable price, a milk that is safe, clean and of good flavor. The conditions surrounding the production and handling of milk subject it to many kinds of bacterial contamination from various sources, and it provides a good medium for the development of most bacteria.

Generally speaking, the bacteria found in milk are foes to the dairy industry. They sour milk, cause it to become ropy and produce unpalatable flavors, and some may cause sickness.

The disease producing bacteria, whether of bovine or human origin, are of immense importance. The health of the consumer is, in some instances, directly dependent upon the health of the animals from which the milk is drawn, upon the health of the milkers or upon the health of those who handle milk or milk utensils.

Among the diseases that may be transmitted through milk are tuberculosis, typhoid fever, scarlet fever, diphtheria, septic sore throat, undulant fever and possibly others.

Records of the New York State Department of Health for the 14-year period, 1917 to 1931 inclusive, show that, exclusive of New York City, there were in this state 100 milkborne outbreaks with 3,759 cases of communicable diseases reported. Most of these outbreaks occurred in small communities and, with two exceptions, were due to raw milk. The contamination occurred at the farm in about 80% of these outbreaks. Carriers on the farm apparently were responsible for the 65 typhoid fever outbreaks. Udder infections were responsible for eight outbreaks of gastro-enteritis, and apparently were the cause of five outbreaks of septic sore throat.

Because of the possibility that the milk may be infected and also because of the imperfections of human nature, it is necessary to have official regulations governing the production and handling of milk. Such regulations are necessary, not only for the protection of the public, but also for the protection of the dairy industry. In those municipalities where milk regulations are enforced properly, it has been shown repeatedly that the consumption of milk has increased as the product is made safe and the quality improved.

Generally speaking, there are two ways of avoiding the dangers in milk. One is to keep harmful agents out through care and cleanliness, and the other, to destroy them by heat. I refer to pasteurization. Because the amount of milk handled by many dealers in small communities is not sufficiently large to warrant the installation of pasteurizing equipment, we must use other methods of protecting raw milk supplies in these municipalities. I refer to the health of the animals, the health of the milkers, milk handlers and handlers of milk utensils, cleanliness in the pro-

duction and handling of milk and refrigeration.

What the consumer wants is a safe milk. He is not interested so much in the methods used or the process it passes through in rendering it safe, so long as it pleases his taste and meets other requirements of good milk. The first requisite for a safe milk is a healthy cow. All raw milk should be produced from cows that are free from bovine tuberculosis, Bang's disease, and mastitis.

As for bovine tuberculosis, we may pass this quickly. The progress of tuberculin testing is gradually eliminating it as a public health problem.

Bang's Disease is a specific transmissible disease affecting dairy cattle, caused by Brucella abortus. It affects cattle of all breeds, both male and female. Mature animals apparently are more susceptible than are young. It is generally accepted that the Brucella abortus may be transmitted to man through raw milk and through contact with infected animals, or with material infected with their discharges.

In man, the disease is known as undulant fever. The organism, *Bucella abortus,* is not highly pathogenic for a great majority of people, but there appears to be a certain percentage who, when exposed to a sufficient amount of infectious material, develop undulant fever. Since there is no satisfactory method of predetermining susceptible individuals, it is advised that everyone should guard against undue exposure.

Pasteurization of milk protects the consumer against undulant fever. Contact infection can be prevented by the detection and removal of infected animals.

Producers realize the importance of healthy animals in obtaining maximum milk production. Many producers know, from experience, that diseases have cost them more than the cost of healthy animals. It is more economical to render herds free from disease, and more profitable to maintain them free from disease, by the adoption of proper disease prevention and control measures, than to maintain diseased herds.

Mastitis is one of the most common diseases affecting the dairy cow. Any factor that involves the udder affects its normal function, the secretion of milk. The secretion may be decreased, entirely suppressed or rendered unfit for human consumption. The animal may, or may not, suffer severely from the disease. The consumers of her product, however, are quite certain to be affected.

Mastitis may be the result of one or more causes. It may be due to infection brought to the teat by dirty hands and milking equipment, injuries to teat or udder, infectious diseases, the improper handling at drying-off period and at the beginning of lactation. The improper use of the milking tube is a frequent cause of mastitis.

During the past year five outbreaks of septic sore throat and one of enteritis have been investigated by representatives of the state health department, and in these instances it was found that those persons infected had consumed raw milk and that mastitis was in the herd from which the milk was produced. In the instances where the investigation was started early enough, the same type of organism that causes septic sore throat was found, upon laboratory examination, in the milk of the infected cows. The inflammation usually followed an injury to the teat or udder.

I do not mean to convey the idea that all cases of mastitis cause septic sore throat or digestive disturbances, but I do wish to emphasize the fact that milk from inflamed udders cannot be considered safe.

Many bacteriologists believe that mastitis streptococcus, the organism causing this disease, is normally present in many cows whose udders are normal. Udall does not support this view. He states: "It is a kind of infection with which we must learn to live and yet avoid the attack." All herds from which raw milk is sold should be examined frequently in

order to detect the first sign of disease in the herd.

The practical control of these potential sources of danger to the public milk supplies is the responsibility of the health officer of each city, town and village.

There has been a tendency on the part of some municipalities to minimize field inspections, and to rely almost entirely on the examination of the product as it is delivered. Proper sanitary control is necessary as a preventative measure, while reliance upon the inspection of the product can show only those things that have occurred.

The milk sanitarian is a guardian of the public health. It is his duty to prevent, rather than to correct, the outbreaks and spread of disease through milk, but once an outbreak occurs, the correction becomes all the more important, and the value of any official depends upon his ability to control both problems. A direct knowledge of the sanitary conditions and the health of animals is necessary if the sanitarian is to be of service to the producer or distributor in correcting the necessary conditions. When trouble occurs, it is impossible to tell from a bacterial count alone whether the trouble is due to unsanitary conditions or to some other cause. A visit by a health department representative should be most welcome because of the help that he may give.

Producers and distributors as a rule are honest people, working for a living and striving to make a success of the business in which they are engaged. Producers know that cattle are probably the same as they were generations ago, and that milk is secreted in the same way, but many are not familiar with the advances that have been made in the knowledge of milk as a carrier of infection or the changes that occur in milk due to action of the bacteria.

Who is best fitted for the position of supervising the milk supply, the veterinarian, dairyman or bacteriologist? With the present increased interest in dairying, in health, and with newly discovered transmissible diseases which may be transmitted through milk and milk products, it becomes almost a necessity that the milk sanitarian of today be a combination veterinarian and dairyman, and be thoroughly grounded in bacteriology. He should know the relation of milk and dairy products to human health. He should be one who can recognize the danger that surrounds the production of this important food, and one who is familiar with the causes of diseases of man that may be carried through milk. He must, by training and experience, be versed in the diseases of cattle that are communicable to man or that affect the quality of milk.

SOURCES OF MILK

Although the cow is probably the most widely used source of milk for human food, many other species are likewise employed by man. Goats supply milk for the Arabs, South Europeans, Latin Americans and the Spaniards. The camel supplies the Egyptians and the Arabs; the mare, the Tartars and the Mongols; and the reindeer, the Lapps and Eskimos. The inhabitants of Asia, especially those of India, milk the zebu or Indian cow, and the Chinese and the Filipinos use milk of the water buffalo. Sheep are milked in the Netherlands, in Greece, in Czechoslovakia, in Italy and in the Balkan states. The yak, belonging to the bison family, supplies the natives of Mongolia and Tibet, and milk from the llama, a relative of the camel, is used extensively in South America. However, in many countries even these substitutes for the cow are lacking. Under such conditions the tendency is to prolong the period of normal nursing, sometimes to an extraordinary extent; thus the mothers in some Indian tribes, among the Eskimos, and the poorer Chinese and Japanese, nurse their children four to six years or even longer.—Connecticut Agricultural Experiment Station Bulletin No. 340, July, 1932.

Oh, Doctor! What Shall I Feed My Dog?

By J. W. PATTON, East Lansing, Michigan

DOCTOR, what shall I feed my dog? This is a very common and pertinent question for the owner of a dog to ask his veterinarian. Common because there is a widespread and well-founded belief among dog owners that much illness and lack of thrift in dogs is due directly or indirectly to improper feeding. Pertinent because the animal is, or has been, ill, and more than likely the owner has received so much conflicting advice as to what to feed his dog, and what to avoid, that he is confused, hopelessly. Everyone, from the breeder who sold the dog to the "Fuller Brush Man" who just rang the doorbell, voiced his personal opinion on how the dog should be fed. The personal opinions have no doubt been contradictory and as variable as the number of persons voicing them.

The dog owner has now addressed the question "Doctor, how shall I feed my dog?" to a professional man—his veterinarian, one who supposedly is an authority on canine nutrition. He expects the veterinarian to answer this question with the same accuracy and dependability that he would answer questions on other professional veterinary subjects. Do we as a profession answer these canine nutritional questions from a scientific background? Or, do we answer them as expressions of personal opinion, just as variable or unscientific as the expressions of opinion of the ice man or brush man? Is it not a fact that in too many instances we have failed to inspire our thinking clients with confidence in our knowledge of canine nutritional problems? Have we in the past presented a reasonable unanimity of opinion? Are we in any better position to do so now? How do our clients feel and what do they think when veterinarians contradict one another?

The writer has entertained such thoughts as those listed above for several years. But it is only during the past two years and as a result of painstaking investigation of commercial dog foods that I have come to a full realization of how many dog breeders think none too highly of many veterinarians' recommendations as to what constitutes a proper, adequate diet for a dog. Times without number the writer was forced to acknowledge this weakness when discussing dog foods with manufacturers, breeders and laymen generally. I am forced to conclude that in too many instances we have failed to inspire our clients with confidence in our nutritional knowledge. We have not helped matters by failing to agree on basic recommendations. We have left the impression that not a few of us are dispensing personal opinion rather than definite information. And personal opinion has been the basis of the advice of the laity themselves. It is not meant to discredit the value of personal opinion altogether; for personal opinion on the matter of feeding a dog when given by the thinking veterinarian may have a wealth of understanding observation back of it and thus be vastly superior to the personal opinion of the dog owner that may be founded upon observation of the effects of feeding in but a few or, at most, but a few dozen dogs and supported by no clear understanding of disease processes that may or may not have resulted from such observed feeding. The advice of too many professional men, however, has bordered on the superstitions of the laity, or has given information for or against foods which the client has had reason to discredit.

It is not my intention to discuss in this article what recommendations should be made. That will be taken up in articles to follow; but rather to point out at this time a glaring weakness and one that has been incompatible with the valuable services veterinarians are rendering, or with our obligations to our clients and

patients. If some of us have failed to meet our obligation to give scientific, helpful advice to any one group in particular, that group is the dog breeder. Dog breeders as a class are pretty much tradition bound, nutritionally and otherwise. On the average, dog raisers do not approach their problems of feeding and breeding with anything like the amount of accurate information on these subjects that the raisers of pure bred horses, or cattle, or sheep, or swine bring to their problems of feeding and breeding. Nutritional matters have always been a problem with the dog breeder. It is the breeders as a group who have learned more than any other keepers of dogs the inadequacies of many of the available dog foods. It is the breeder also who knows better than others our weaknesses in matters of the nutrition of dogs.

As a profession we have been criticised times without number about our disagreement on nutritional problems. More often than not these criticisms have been unjustified in their general application; but because there has been some cause for the criticisms they have carried weight. One of the more recent of these public "slaps on the wrist" appeared in the May, 1932, issue of The American Kennel Gazette. The author of this article, "My Experiments with Dog Diets," is no less an authority as a dog breeder than Mr. Leon F. Whitney, the author of the original, excellent and timely work, "The Basis of Breeding." The following statements are taken from this article. Many sentences and whole paragraphs are omitted. But nothing is omitted that changes the meaning of the parts quoted.

Suppose that you were feeding a diet that was thought by people in general to contain all the essential ingredients of a complete diet, and then suppose that you were unable to raise a single puppy for nearly two years. How would you feel? You would feel like I did, after I had lost nine complete litters of bloodhounds and a number of litters of other dogs used in my experimental breeding. You might begin to get curious as to why the bitches you had boarded out on farms seemed to do well and raise puppies, and why those under home conditions failed to raise theirs. The interesting part of it all was *the advice which was given me by veterinarians whose business it was to know how to feed dogs* (italics mine. J. W. P.) as well as how to administer to their other needs. There were doctors, too, who made suggestions, and practical dog breeders. Most of them advised me to give up keeping dogs at home until such time as the premises could become free from the infection that was causing my trouble. The veterinarians of course, as you may expect if you have had much occasion to call them in, advised my giving a raw meat diet with vegetables chopped up in it, cooking stews, and all the usual things. Nearly all felt they could trace a possible source of trouble to the fact that I fed corn meal, but I knew of the thousands of dogs all through the South that not only survive but prosper on a corn meal diet, and I discounted their advice in this regard. Indeed, the more I talked with people, the more I found how tradition-bound they were in the field of diet. So I began to make some studies myself, and was fortunate in not having any pre-conceived ideas which had been taught me, which I had to unlearn. My ideas were based upon observations of systems of diet which I had observed in many sections of the country. I had tried to find the best in each, and the reasons of their success, if they were successful. But beside this, my observations brought me into scientific laboratories, and that was where I really learned something new. The scientist has a way of looking at a dog that the layman hasn't learned. He regards a dog as an organism, just one of many, that will respond to external stimuli. He knows the way that a dog differs from other organisms, for example, he finds that the dog has a different kind of saliva than we have or that many other animals have. Whereas, when we chew food, we change the starch to sugar in our mouths, the dog cannot. Now, that one fact is one of the most important to know, and yet how many dog breeders ever think of it? Then another point that I observed was this: That dogs can and do exist on the widest possible variety of diets. The scientist studying nutrition first, learns what are the dietary requirements of dogs, then sets out to furnish these requirements in any form that comes handy, or in a form he may be using to test the physiological effects of diets.

For example, here is one diet that was being used in certain tests in one of our most famous laboratories. It is purely artificial from start to finish. Practically nothing is given the dog in the form in which nature grew it; commercial casein, cane sugar, boiled butter fat, lard, bone ash, and a mixture of essential salts and vitamin-bearing substances. Now, if you ask nearly any veterinarian if that diet would be good for dogs, his tradition would make him moan and wail.

Swing from this extreme to another diet, in which the dog seems to have nothing but meat. And for another example, take the dog that is fed on the artificial diet of dog biscuit, canned lean meat, and vegetables ground up with the diet. All three types of diet seem to nourish the dog and keep him well. Indeed, he can live on a wide variety. So it struck me that actually it didn't make so much difference what the dog got, if he got enough of the right elements. The first important fact I learned was in regard to the dog's saliva. What we do when we chew food is to split the starch into sugars, chemically. Now,

if the dog couldn't do that, then it was not correct to feed starches to the dog. But wait a minute: heating the starches when moist would do it. So I decided that if I were to put boiling water on cornmeal or other ground grain and let it stand, that I would be making a food that a dog could digest without chewing. I must split the starches. But that was already done in foods like bread and bakers' products. There were ample carbohydrates in these products, too, although the white flour products tended to be constipating. Why not use these as a base, or plain cornmeal heated with boiling water and allowed to stand. These would be my bases.

But there was the animal protein to supply. I remembered from my nutritional courses at college that hogs grew faster when there was a little animal protein, and so I considered the chief sources. Dried beef scraps first suggested themselves. I had used tons of that in the past. But I found that it was deficient in iodine, as, in fact, is the diet of most of our dogs. What about fish, I thought. Two veterinarians advised against feeding fish. "Dogs do not digest fish readily," they had been taught, but I thought of the thousands of dogs that subsist on an exclusive fish diet, and this more than ever made me scorn the old school of veterinary advice. I'd try fish. It contained 60 per cent protein and more. It was rich in iodine, richer than any other source. It contained phosphorus and calcium. So I tried a diet of whole wheat bread, alfalfa and fish meal. It seemed to work. Then I told a professor about it. "What about some animal fat?" he inquired. "What form would you advise?" I asked in reply. "Beef suet. Give each dog a good lump every day." "Ah! But that is against the advice of tradition and veterinary practice. They are always harping on giving dogs lean meat and keeping the fat away." The professor scowled. I saw through the scowl. I went home and began to add beef suet to the diet. My diet had now come to be crumbled whole wheat bread or white bread or cornmeal heated with boiling water, alfalfa leaf meal, ground fish and a lump of suet, plus dried ground bone. And there, friends, you have my diet on which my dogs have been reproducing, growing and living in the best health I have ever known my dogs to enjoy. There are plenty of every vitamin. There are all the minerals, including iodine in abundance. The proportion of protein, carbohydrate and fats in accordance to accepted standards, roughly about 22-48-20. There is animal fat, animal protein. The only element lacking seems to be tradition, and results seem to show that this isn't altogether an essential element for a dog's nutrition.

Now, colleagues, this is but one of many similar articles which have come to the attention of the writer. Many times, when talking with dog food manufacturer, breeder or dog owner, similar experiences have been recited. Many of our clients will agreed with Mr. Whitney. We as veterinarians will have to agree that such conditions exist; but it is taking in too much territory to leave the impression that this criticism can be applied to the veterinary profession in general, for this is not true.

Mr. Whitney has inferentially indicted the whole veterinary profession in the charge of not knowing its business so far as the feeding of dogs is concerned. His high standing among dog breeders and the prestige of the magazine that published his article both require that his charge be answered.

It is axiomatic among military men that the flanks of a field force must be protected or disaster may ensue. Further, that advance elements must not be pushed forward beyond the reach of supporting forces. Mr. Whitney has laid himself wide open to three lines of attack; on either flank and frontal.

1. Mr. Whitney presumed to evaluate the average competence of the veterinary profession from his personal experience with a few individuals. It can't be done. The veterinary profession, like other professions, contains individuals that do not measure up to the standard. The same is true of doctors of human medicine, of lawyers, of the clergy, etc. Among professions, as among artists and artisans, there are "weak sisters." That is universally recognized, so let us away with generalizations on groups because of the shortcomings of individuals.

2. Mr. Whitney assumed a premise to be sound because it is supported by experience with "nine complete litters of bloodhounds and a number of litters of other dogs." It seems this scarcely requires comment, but by way of making the writer annihilate himself one might ask his attitude toward the position of an amateur in breeding who would attempt to explain the laws of heredity from an experience so meagre. The problems of animal nutrition are not so simple as the author apparently supposes them to be.

3. Mr. Whitney exposes his front to many opportunities for infiltrating his forces by attack on specific statements that cannot be supported. To begin with, he attempts from a few personal contacts to deduce the attitude of the veterinary

profession. We find him saying that veterinarians have been taught that dogs do not digest fish. I wonder what veterinarians were ever taught this, and when, and where. And again: feeding fat to dogs is against the tradition of veterinary practice. Yet, a regimen of raw hamberger steak to which 25% to 50% of beef suet has been added is one of the commonest prescriptions of veterinarians for certain types of malnutrition in puppies and convalescent dogs. If we are to judge the attitude of any profession on any subject it must be done by the literature of that profession. Personal contacts are too limited. There is not a thing in the recognized literature of the veterinary profession to support either of the foregoing statements of Mr. Whitney, but there is ample evidence to confute both.

To hasten through with a few other of the author's statements in the quotation given above: No evidence is given that the advice as to feeding wouldn't have worked. Perhaps in the given case it would have obviated the trouble. Mr. Whitney appears to resent his veterinarian telling him to feed his dogs *raw* meat. We will let him in on the secret of this raw meat advice of veterinarians. In the first place, raw meat is good for a dog. So is cooked meat, but feeding it raw saves the trouble of cooking. Of course, one can obtain meat for dogs already cooked, but what meat? Until very recently what information did veterinarians have as to what was in canned dog food? What does he know yet about what is in many brands of this food? Nothing pertinent that the manufacturers have told him. The veterinarian is simply protecting his clients when he refuses to advise the use of a dog food of which the manufacturer has supplied no dependable scientific evidence of its adequacy.

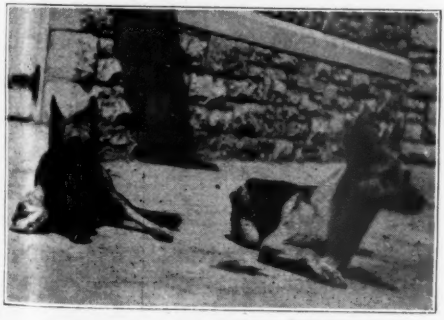
Mr. Whitney complains of advice against feeding corn meal to his dogs. The advice was sound. Cornmeal is the poorest of the cereals for dogs—for man too unless it be amply supplemented. (Refer to the history of Libby Prison in Civil War times.) Dogs in the South do not "prosper" on it. But that is a long story. See Goldberger's experiments with pellagra producing diets. As for starch in the diet of dogs, veterinarians know, veterinary literature has reported scientific experiments that show conclusively that dogs digest starch as thoroughly as does man. That is not saying, however, that it is as valuable a food for dogs as for man. Thus "the first important fact" he learned is without practical significance, since this bit of digestion occurring in the mouth in man takes place in the intestine in the dog. Mr. Whitney's soaking starch in hot water neither helped nor hindered its digestion by his dogs. His finding that minerals, vitamins and protein were necessary to the diet of his dogs can scarcely be rated as a discovery. His statements concerning iodine are of course personal opinion. Both reason and known facts confute them.

Now, having answered to my own satisfaction the general criticisms of the veterinary profession that Mr. Whitney has seen fit to make, I desire to discuss the subject further in a far more friendly fashion. I think his article will do us good in that it will awaken us to a better appreciation of our obligations to our clients and our patients. The veterinary profession has sufficient meritorious achievements to its credit to enable it to withstand this parade of shortcomings before the foremost breeders and fanciers of this country and abroad. The average small animal practitioner appreciates that our knowledge of nutrition of the dog is sadly in need of revision and extension. However, it is not within his province to institute and maintain nutritional experiments. That is a field in itself.

The dog occupies a rather unique position. A position intermediate, as it were, between the farm animal and man. He is an animal of little or no economic importance, based upon his service to man. He supplies neither power, as does the horse, nor food, as does the ox. Still, he is an animal with great sentimental value. In other words, we think a great deal of

him, yet not much has been done for his welfare. Not much, in a scientific research way. He is denied public funds for research because he is not a farm animal. The veterinary profession is closely connected with things agricultural. Agricultural experiment stations, both state and Federal, furnish us with a great deal of experimental data on all common domestic animals except the dog (and cat). On the other extreme, he is denied public funds supplied in such abundance for research into health and nutritional problems of man. With the research problems of man, the dog is a means to an end—usually his end. There is but one group to whom he can look for relief. That is the veterinary profession. No other scientific group is interested in him. Some work is being done in his behalf at some of the veterinary clinics in connection with our veterinary colleges. But, again, veterinary colleges are supported by public funds; in most instances they are parts of agricultural colleges and a continuance of their appropriations depends largely upon the showing they and their graduates make in their service to agriculture. The dog is the forgotten animal when appropriations are made.

Research into the diseases and nutritional problems of man in addition to the public funds is the recipient of vast private donations. The problems of the dog can never hope to compete with the problems of man in such donations, but they merit more consideration than they receive. On the whole, a considerable amount of money is donated or bequeathed to humane and other organizations each year to be expended for the welfare of animals. With the single exception of the "Field" distemper fund, I do not know of a dollar of all these thousands of dollars that has ever been expended for the benefit of the canine race! The whole sum is frittered away year by year in gathering up and painlessly destroying homeless dogs and cats or in treating the ailments of animals belonging to persons unable or unwilling to pay for the treatment of their pets. Nothing is ever done to prevent pets from becoming homeless, nothing to prevent their becoming sick, nothing to discover better means and methods of treating them when they are sick. In other words, not one thing is done to solve the problem with which humane organizations are confronted. The attempt is made merely to meet it more or less inadequately from day to day and year to year unendingly. A modicum of the amount thus futilely (as applied to all dogs) expended if used to dig into some of the problems of dogs and solve them would confer benefits on that animal and those who love him so immeasureably greater both now and in all time to come as to make the present nibbling at day to day alleviation seem not only preposterous but tragic wastefulness.



Posterior Paralysis of Dogs.

In view of the very limited support that the veterinarian has had in his pursuit of knowledge of the nutritional requirements of dogs, I think the veterinary profession has done exceedingly well in collecting and correlating observations of its members, in carrying out a limited research in connection with busy practice, in assimilating promptly all the dependable information afforded by veterinary clinics and in picking out and incorporating in its own practice every bit of information on the dog's nutritional problems that has been developed as a by-product of investigation of the nutritional problems of man. An investigation of veterinary literature, an examination of back numbers of this magazine over a period of years shows conclusively that this has been done.

CORRECTING TAIL CARRIAGE IN DOGS

What the marcel is to a woman the proper tail carriage is to a dog. Many otherwise splendid specimens of the canine family have lost prestige in the show ring or upon the boulevard by an incorrect tail carriage.

To each breed is assigned the proper tail carriage and length of tail and upon the veterinarian devolves the duty of cropping the tails of the Irish terrier, the fox terrier, the airedale and Welsh terrier, the sealyham and the Kerry blue and many others; and of lowering the gay tail of the Boston or the German shepherd or collie. A good Scottish terrier who should carry a gay tail may have instead a squirrel tail or a sickle tail, which a skillful surgeon can correct, thus perhaps converting him into a winner.

There are other breeds, such as the Pomeranian, chow and Pekingese, whose plume should drape itself along the spine. In such cases a drooping tail that drags behind becomes an abomination and the feat is to make the depressor muscles forget to pull and let the elevators carry the oriflamme properly upward. So whether the mode of improper tail carriage be upward, downward or lateral, it becomes improved when corrected by the operation of a skilled surgeon.

The patient is best prepared by general anesthesia, although spinal anesthesia is also satisfactory. As shaving the hair from the tail attracts undesired attention to the operation, we immerse the tail in bathing alcohol for preparation and operate without clipping or shaving.

A No. 12 Bard-Parker curved blade with the back ground off makes the neatest operation with a smallest skin incision. An incision is made midway between joints and the blade is inserted full length subcutaneously and by a rocking motion, the muscles and tendons are cut down to the bone, releasing the tension that has been pulling the tail around improperly. Incisions are repeated between joints from one end of the abnormal curvature to the other end and then the tail is bent in the opposite direction to a degree equal to the curvature that formerly held. This bending should be repeated carefully once daily for three or four days after operating to break down adhesions and prevent reunion of the severed ends of muscles and tendons.

After operation the tail must be kept bandaged with sterile dressings to prevent any infection. If the correction is not as complete as desired, additional corrections may be made later under a local anesthetic until the tail carriage is in perfect conformity to the standard set for that breed of dog.

Where the deflection of the tail from the proper position is less pronounced and a slight correction will suffice, it may be obtained readily without the dangers attendant upon the previously described operation of severing the tendons by the following procedure:

Prepare an aseptic field and shave the skin over the convex surface after desensitizing the area.

Remove one or more elliptical segments of skin and fascia on the convex curvature from ¼ to ½ inch in width. Suture the separated margins with silkworm gut ligatures interrupted sutures about ¼ inch apart. Bandage aseptically and splint to maintain the proper position of tail for seven days.

In the dog that is kept simply as a companion this operation when needed is all to the good. In the show dog it is in a class with other means that are used to make a dog appear his best. In the dog that is to be sold for a breeder this operation is on a plane with the resection of "tyes" in cattle so strenuously objected to by some of the breed associations and by officials of the International Live Stock Exposition.

A. A. Hermann.

Denver, Colo.

The textile-fibre producing animals are: Sheep, alpaca, vicuna, camel, angora goat and cashmere goat.